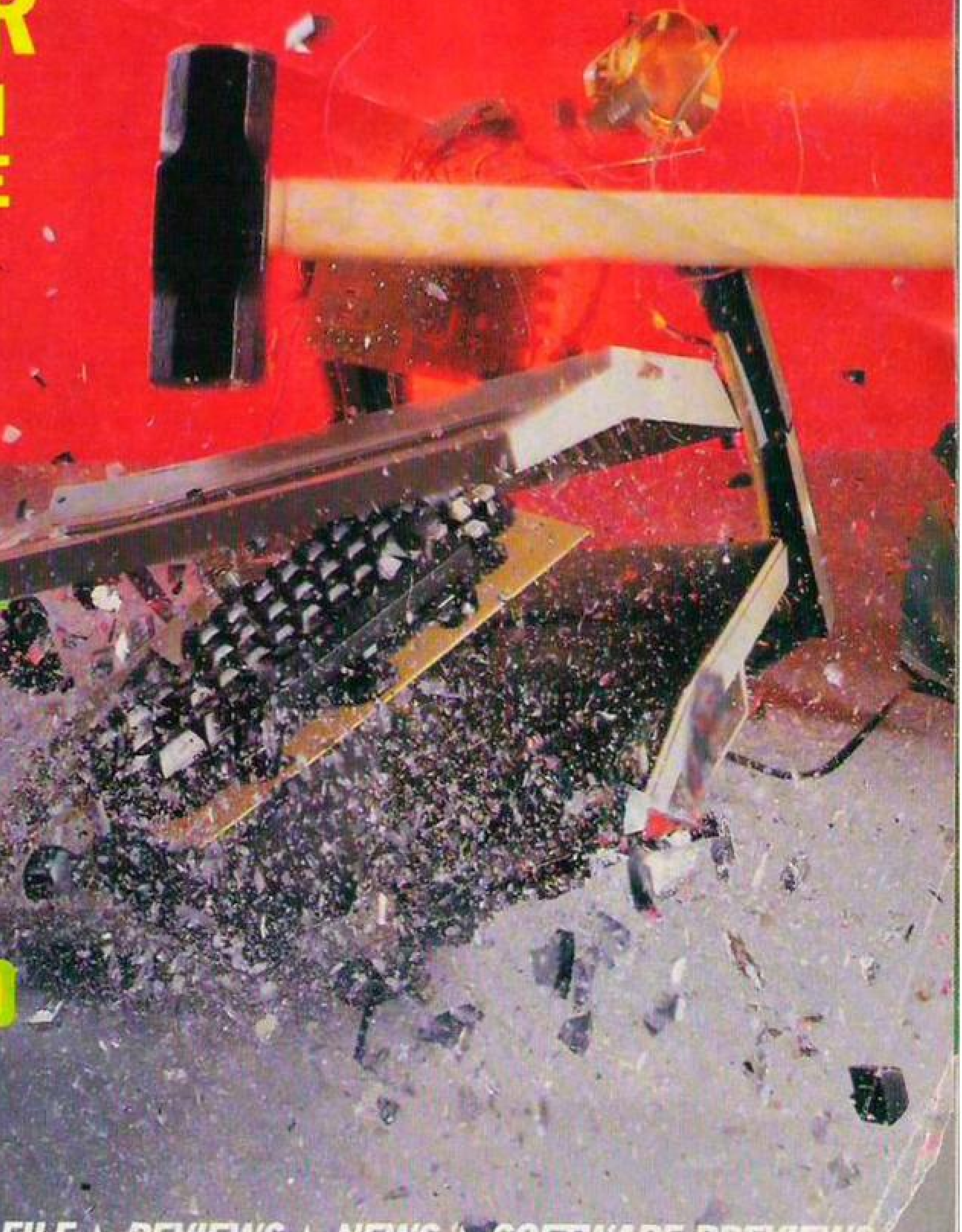
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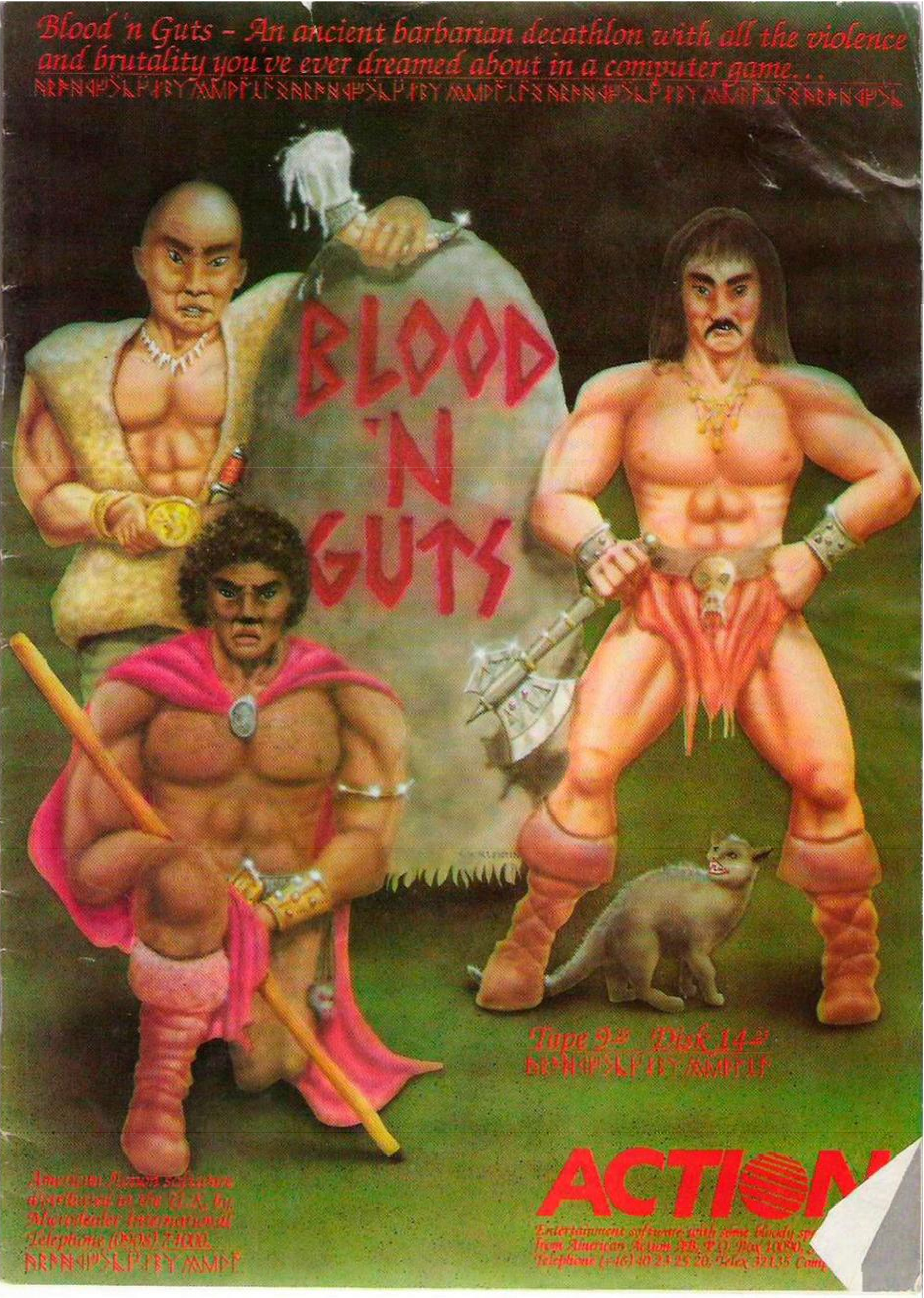
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Back issues of the magazine from January 1986 onwards are available for £1.50 (U.K.), £3 (Overseas) from the Back Issues Department, 79-80 Petty France, London, SW1H 9ED.

CONTENTS

MICROS U
There is an alternative
computers – the auct



13
LOCOSCRIPT ADDITIONS
Locomotive Software has been hard at work producing new extras for its well-loved word processor. We examine them.



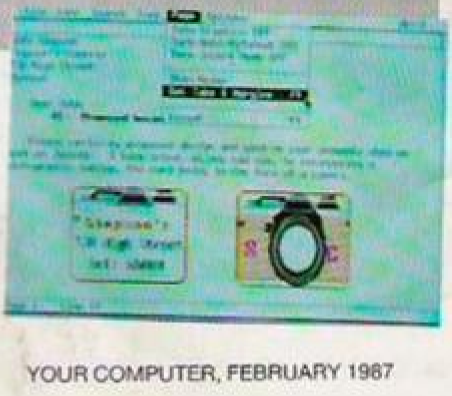
15
THOMSON MONITOR COMPETITION
Win a colour and monochrome monitor in this easy-to-enter competition.

26
PROGRAM THE EXPERT WAY
Making the most of Sounds on your spectrum 48+ and 128.



36
COMPUTERS IN ACTION
This month we look at the latest technology of one of the oldest car recovery services, the AA.

32
LOW-COST PC WORD PROCESSORS
With a new generation of PC clones selling for less than £500, *Your Computer* examines suitable software.



S UNDER THE HAMMER

rnative to paying full price for your
e auctions, all is revealed on page 42



35

DELTA

An exclusive appraisal at the latest blast from Thalamus.



40



DREAM MACHINE

Can the Apple IIGS compete with the ST and Amiga?

52

PRINTERS ON PARADE

There is now a vast number of low-cost NLQ printers. We examine some of them.





54

SPECTRUM TO AMSTRAD (part II)

The conclusion of this programming feature.

74

COMMODORE EXPANSION

Good peripherals are not common for the C64 We look at some aimed at disc drive owners.



NEWS
8 All the recent developments in the computer world and details of new products.

CHARTS
16 The top twenty and budget games.

SOFTWARE PREVIEWS
17 *Your Computer* looks at the software to be released in the near future.

SOFTWARE NEWS
19 Francis Jago looks at all that is new and exciting in the wacky world of games.

COMMUNICATIONS NEWS
20 Our comms expert keeps up-to-date with the latest.

ADVENTURE NEWS
21 Our resident adventurer, Roger Garrett, tackles the new releases.

LETTERS
24 Positive feedback from our readers and a £25 prize for the star letter.

BOOKS
38 More books to wile away the long winter evenings.

SOFTWARE SHORTLIST
45 The boys with the joysticks take to the computers once more and sample the latest games.

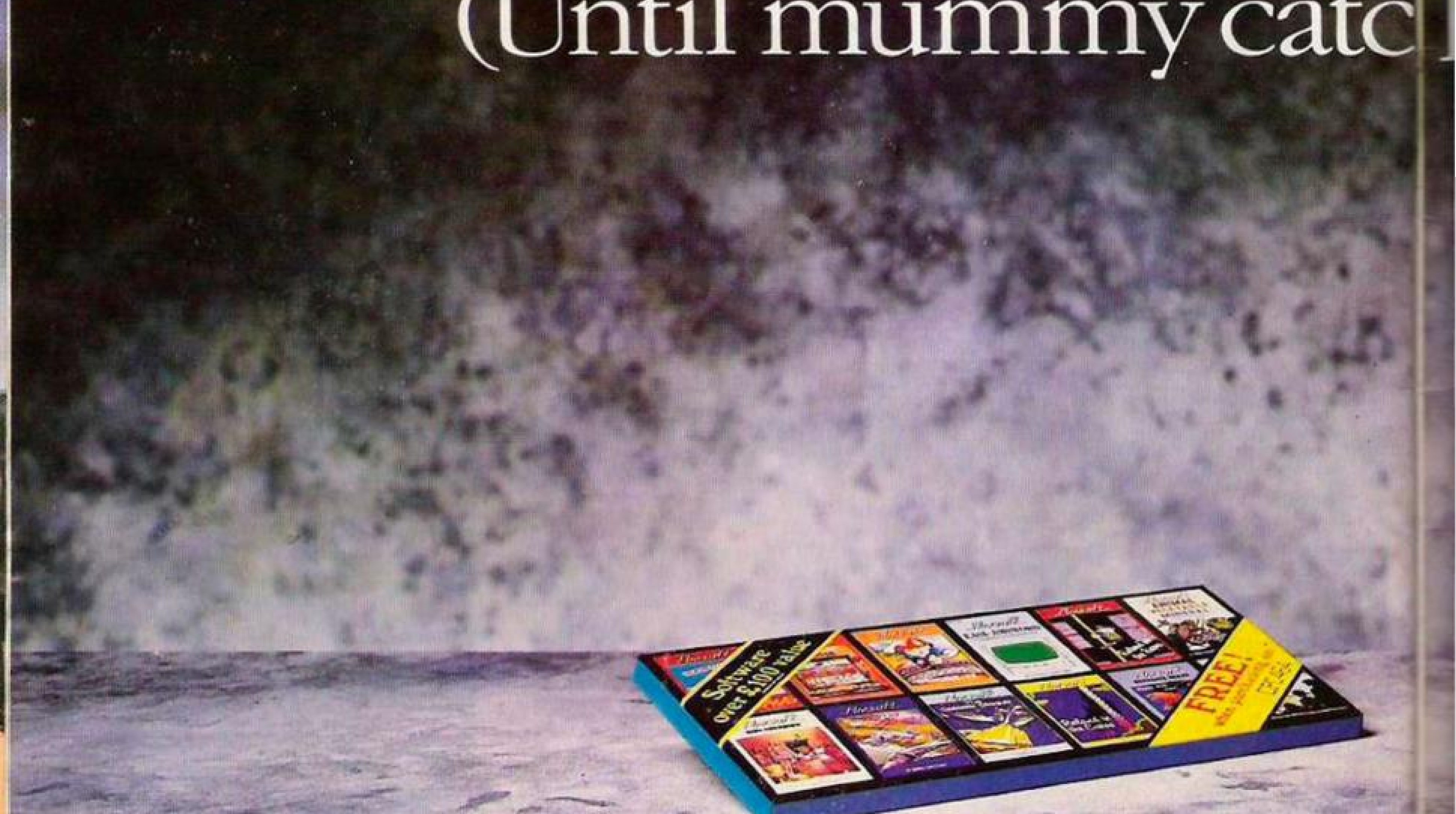
SOFTWARE EXCHANGE
56 We continue our sale and offer all the Commodore tapes once more.

LISTINGS
60 More programs for you to type-in.

MUSIC MACHINE
68 The new Spectrum music peripheral is reviewed.

ROBOTS
74 *Your Computer* reviews the history of robots.

With monitor, data
£100 of software yo
(Until mummy catc



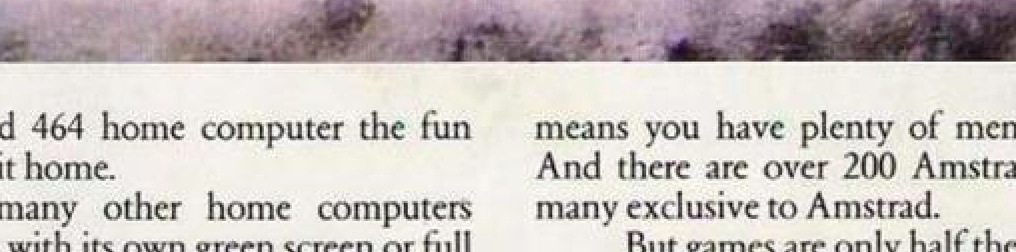
With the Amstrad 464 home computer the fun starts as soon as you get it home.

Because unlike many other home computers the 464 comes complete with its own green screen or full colour monitor.

It also comes with a convenient built-in datacorder.

And you get £100 worth of software with games like Harrier Attack and Sultan's Maze. Not to mention Oh Mummy.

64K of RAM means you have plenty of memory to play with. And there are over 200 Amstrad games you can play, many exclusive to Amstrad.

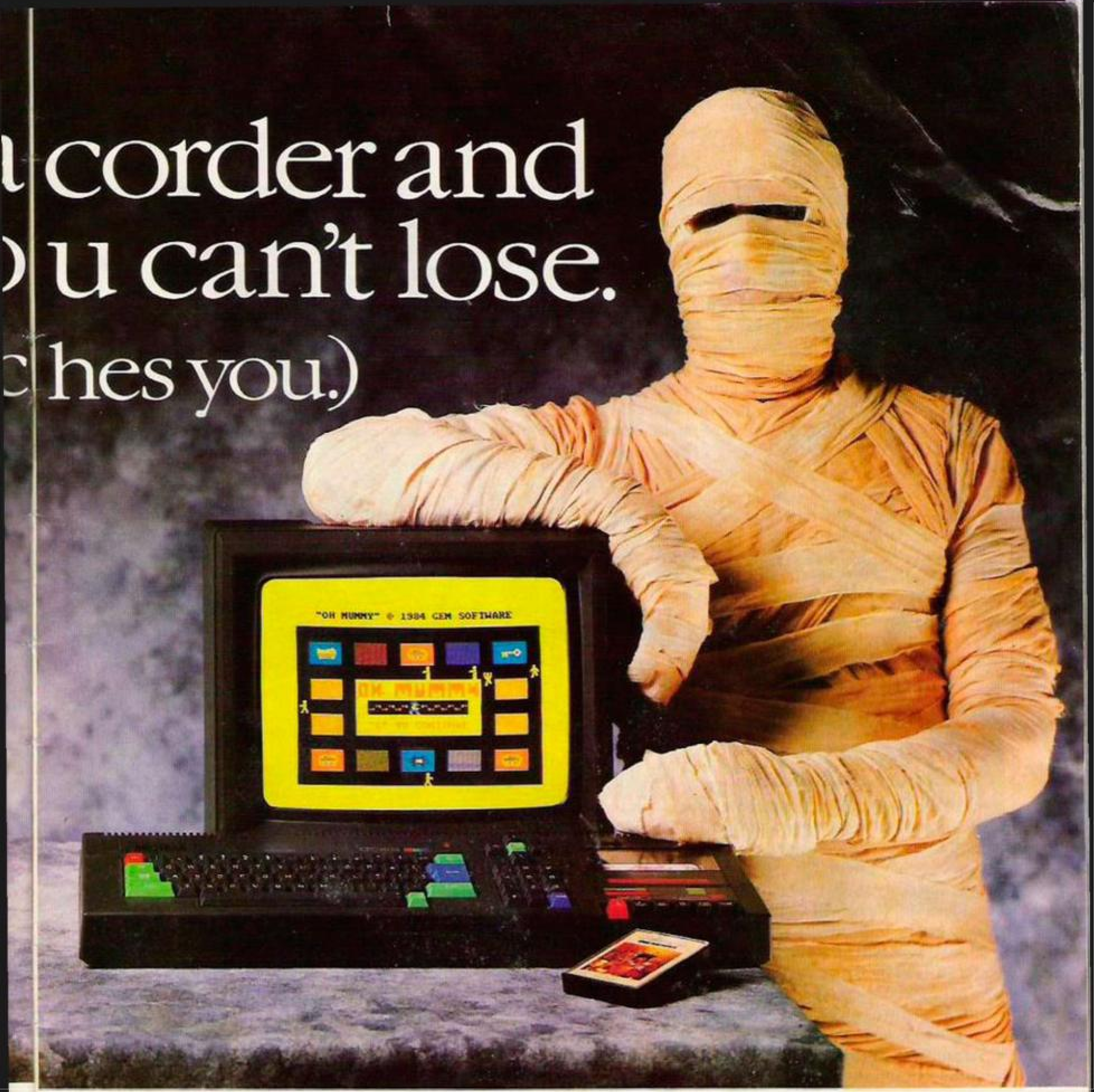


But games are only half the fun on the 464.

The kids can learn spelling and arithmetic with software like Wordhang and Happy Numbers.

Whilst adults will love the way that it helps around the house with budgeting and accounts.

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To help you make the most of your 464, you can join the Amstrad User Club.

And there are lots of books and magazines devoted to it as well.

What's more you can buy joysticks, printers, disc drives, speech synthesisers and light pens to make it even more fun.

But perhaps the most pleasurable thing about the 464 is the price.

The complete home computer costs just £199 with green screen or £299 with colour monitor.

Not much to pay for a chance to get away from mummy.

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Like soldiers, old computers never die, they simply fade away. Machines which have long since ceased to be current models are still in use throughout the country. Computers from the Osborne to the Dragon or Oric still manage to give useful service to a handful of dedicated owners.

The decision to upgrade from a model which, by the standards set by some of today's hardware is rather limited, is often a more difficult one to take that the initial choice of machine. A computer system is more than a collection of hardware. In many cases the software supporting the operation of the hardware, both commercial and that written by the computer user, represents a considerable investment both in time and money.

In addition, having used a particular system for some time, the user will be familiar with all the techniques required to get the most from the system. Switching to a new computer inevitably will mean that time will have to be spent mastering a new set of operating procedures.

There will be a time, though, when the gap between the performance of an existing system and that offered by more modern computing hardware will be so great

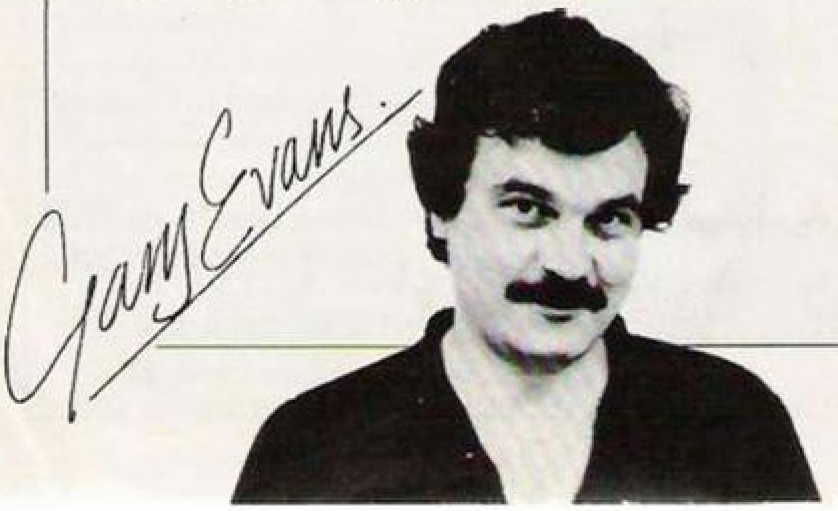
COMMENT

as to make the decision to upgrade unavoidable.

Having taken the plunge and decided to upgrade, it is vital that the specifications of the new system are compared carefully to those of the "old" computer. Unless the increase in performance offered is considerable, there will be little point in spending money on the upgrade.

Many users will buy a new computer on impulse, being swayed by the arguments of the marketing men who promote the idea that a new stylish box and slight re-engineering of an existing design can somehow impart a new lease of life to a tired design. The good old dead flesh Spectrum 48K Spectrum with joystick adaptor and suitable cassette recorder offers as good a performance as the latest Plus2 version of the design.

When upgrading, take care to ensure that the money spent will mean a significant increase in the computing power at your disposal. Do not chop and change computers simply to keep up with the Joneses.



Mains Minder

Hampshire-based RIC Ltd has released a range of self-contained portable mains filters, designed to provide protection for desk-top computers and microprocessor-based equipment.

The filter is called The Minder and is designed round a proven filter circuit comprising an earth line choke and large varistor. The mains filters are housed in a steel case and it is supplied with a two-metre mains lead.

The filters are available in single- or four-socket versions and can be installed easily. In addition to providing protection from mains inteference, the Minder can also be used to isolate a piece of equipment known to produce interference.

Further information from RIC Ltd, Budds Lane, Romsey, Hampshire SO5 0ZQ.



Free software

Computer buffs who remember the early days of the Commodore range will no doubt remember names such as the Plus 4, Vic, Pet and CBM C-16 computers, all of which are no longer made by the company. It is because of this that very little new commercial software is being made for these machines.

An international Commodore users' group called the Folklife Terminal Club has issued a new catalogue of software from its archives. It has more than 6,000 user-written programs in the areas of education, business, games and graphics.

The programs are stored on diskette and are available on various configurations of the out-dated machines, as well as the C-64 and the C-128.

The software is free but it is necessary to order the "catalogue on disc" which contains a listing of all the available software in the Folklife library. There is a copying and mailing fee of $15 per diskette and they must be international money orders. It is important to specify which computer you own.

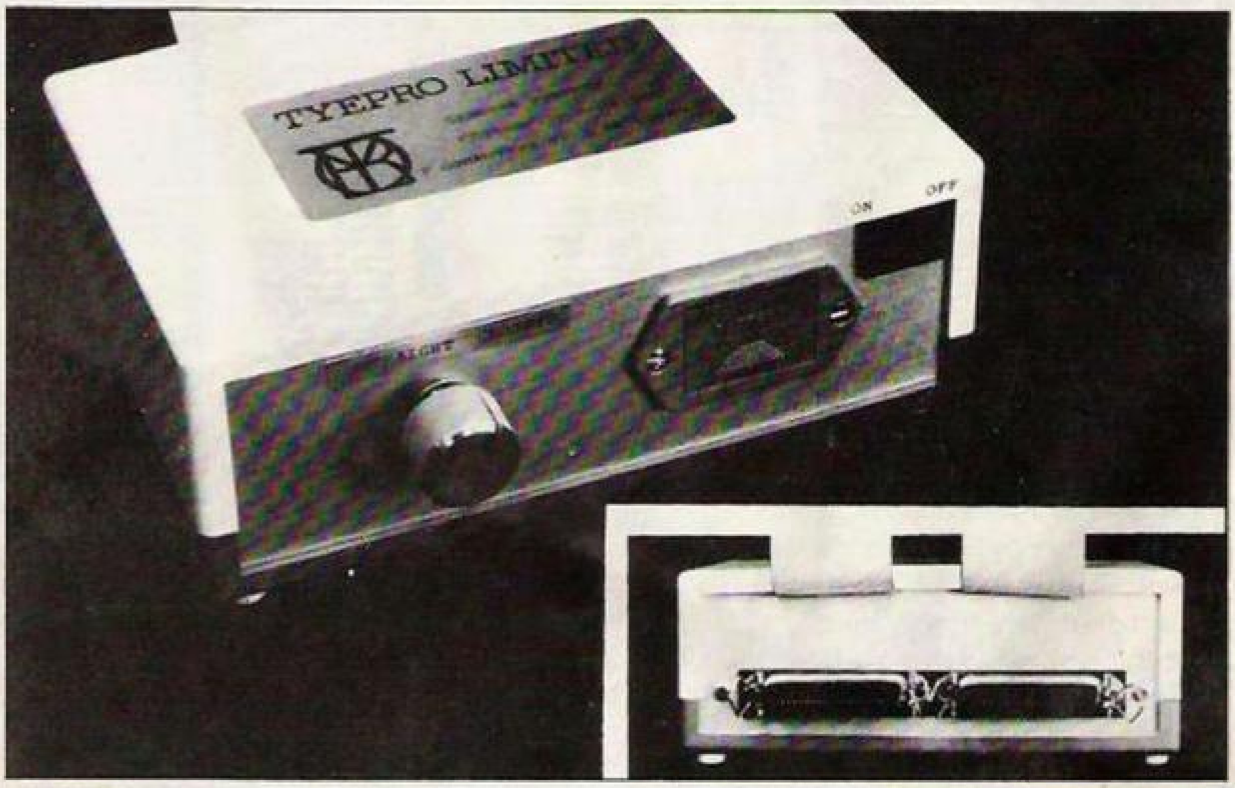
Further information from Folklife Terminal Club, Box 555-NC, Co-op City Station, Bronx, NY 10475, U.S.A.

Crossed lines

Tyepro Ltd, the Cambridge-based computer specialist, has introduced another connection product to its extensive range. The Centronics X-switch allows two printers and two computers to be used at the same time. Both printers can be used simultaneously by either computer as the switch can change from 'thru' to 'crossed' almost instantaneously.

The X-switch uses low-power CMOS chips and is powered by a single 9V battery but for an additional £6 a mains adaptor can be supplied.

The unit is in two-tone grey and measures 190 by 110 by 60mm. and costs £99.95 including VAT. All the necessary cables are supplied with the X-Switch and it can be obtained from Tyepro Ltd, 30 Campkin Road, Cambridge CB4 2NG.



Amstrad Miracle modem

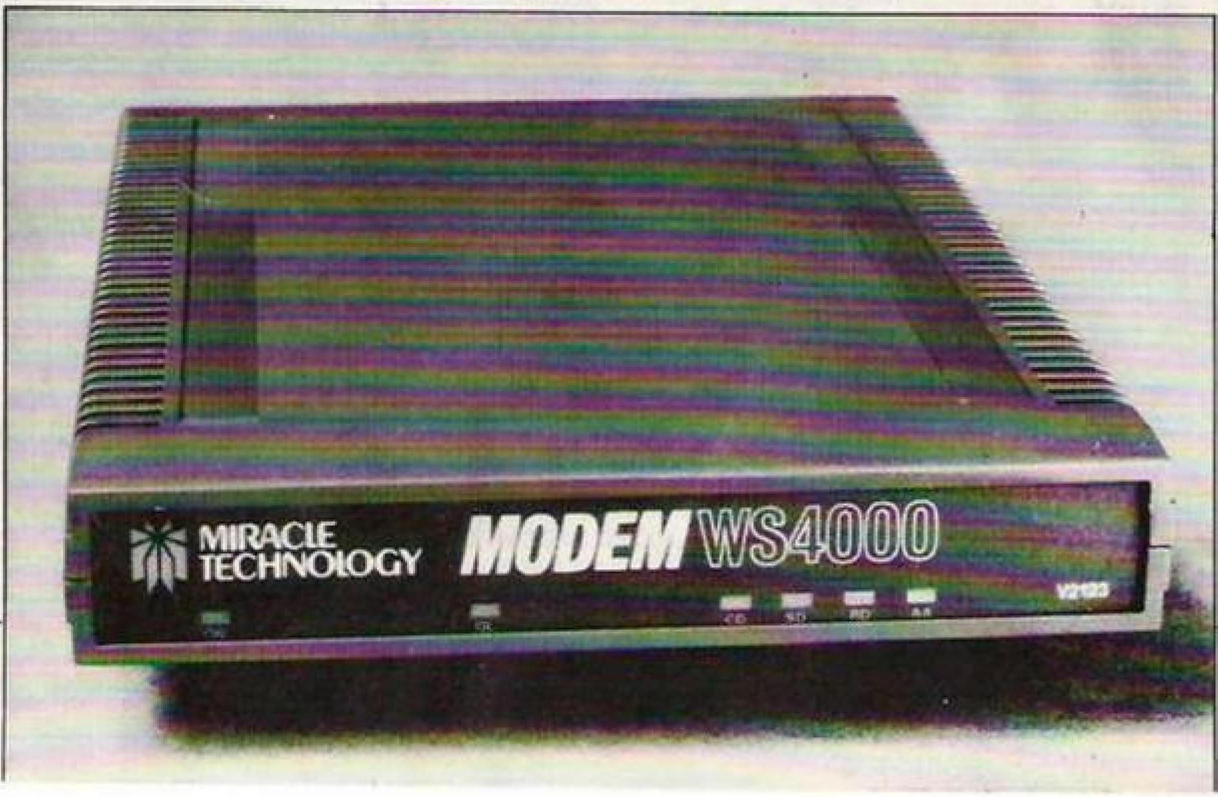
The world of data communications is being opened for owners of the Amstrad PCW8256 with the release of a new modem and interface package. The WS4000 modem and interface package from Miracle Technology has been developed from the company's best-selling WS4000 modem and is fully upgradable from the standard V21/V23 and V22.

The modem is equipped with auto-dial, auto-answer, full Hayes intelligence and an Amstrad interface, and is supplied with all the necessary cables for £169.95 excluding VAT.

The machine is very simple to use, requiring no specialist knowledge. A comprehensive list of U.K. and International databases is supplied free with the package, together with full operating instructions.

The package uses the Amstrad built-in MAIL232 communications suite but for uses requiring additional software the package is available with *ChitChat* for £259.90.

The modem works with both the 256 and the 8512 and is available through computer dealers, or by contacting Miracle Technology (U.K.) Ltd, St Peters Street, Ipswich IP1 1XB.



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Willis Computer Supplies has introduced a special offer to customers intended to benefit charities. The company is prepared to donate five percent of the value of orders in excess of £150 to the purchaser's nominated charity.

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EDUCATION STANDARD

The European Education Standard Microcomputer being developed by Thomson, Olivetti and Acorn will use the OS-9/68000 operating system. Expected some time in 1987, the computer is intended to familiarise a whole generation of European schoolchildren with computers and to influence strongly the adoption of a universal operating system.

The OS-9 is available on the Atari ST range and has recently been announced by Philips and Sony as the compact disc interactive standard.

Since its launch in 1983 by Microware, the OS-9 has been licensed by almost 300 manufacturers for use in a variety of industrial, scientific and consumer products. The operating system is available with powerful development languages and tools including Basic, Pascal, C and Fortran.

Training solution

A new college has been launched to cater for the increasing demand for training in the use of personal computers. Based at Kingston, Surrey, The Micro Solutions Training College is aimed at first-time owners of the new generation of low-cost PCs.

The first of the courses were run in December – both formal training sessions and workshops aimed specifically at small businesses.

Further information from MSTC Training College, Devon House, High Street, Thames Ditton, Surrey KT7

Follow that Star

Star has announced the launch of its latest N series printer, the NX-15. Intended as a replacement for the successful SG-15, the machine costs £389 and, like all the N series printers, features a full front-control panel which saves the irritation of fiddling with the back or inside of the machine.

Included as standard are tractor and friction feed, together with an automatic single-sheet feeder for letterheads.

AppleWorld success

The first exhibition at London's Islington Business Design Centre, AppleWorld, attracted 9,600 visitors.

David Hancock, managing director of Apple, says: "We achieved all our goals, getting very close to our target number of visitors, who represented quality rather than quantity."

The venue proved successful for many of the third-party new product launches. AppleWorld 1987 looks as if it will be equally if not more successful.



Continuing the Cheetah tradition

Cheetah Marketing has released its latest product, the Mk5 Midi keyboard. Following the immense success of Speedrum, Amdrum and the range of sound samplers, the Midi is probably one of the most sophisticated slave keyboards on the market. Representing more than six months' work, the keyboard has been developed exclusively for Boots.

The full-size, five-octave polyphonic keyboard contains a powerful computer and is suitable for a range of uses when connected to other equipment. Special features include a pitch bend wheel, octave shift function, LED displays and Midi Out, which is assignable to any one of the 16 Midi channels.

The unit can also be used as a computer music controller, via the Cheetah Mini interface and can be connected to a Spectrum or any of the Amstrad CPC range. The Mk5 costs £99.95 and interfaces an additional £29.95.

Further information from Cheetah Marketing Ltd, 1 Willowbrook Science Park, Crickhowell Road, St. Mellons, Cardiff.



Konix COMPETITION

Welsh-based Konix is inviting people to guess how long its Speed King joystick will last in a continuous game of *Daley Thompson's Decathlon*. The person with the closest guess will win £100. The joystick will be operated by a machine and it will be in constant use until it ceases to function. Konix does not know how long the joystick will last but is convinced it must be the ultimate way of testing the durability of one of its products.

The test is to be held at a neutral location and entries on a postcard are welcomed and should be sent to:

Daley Thompson's Decathlon Test, c/o Solution Public Relations, 2 Wellington Court, Varndean Park, Brighton BN1 6TD.

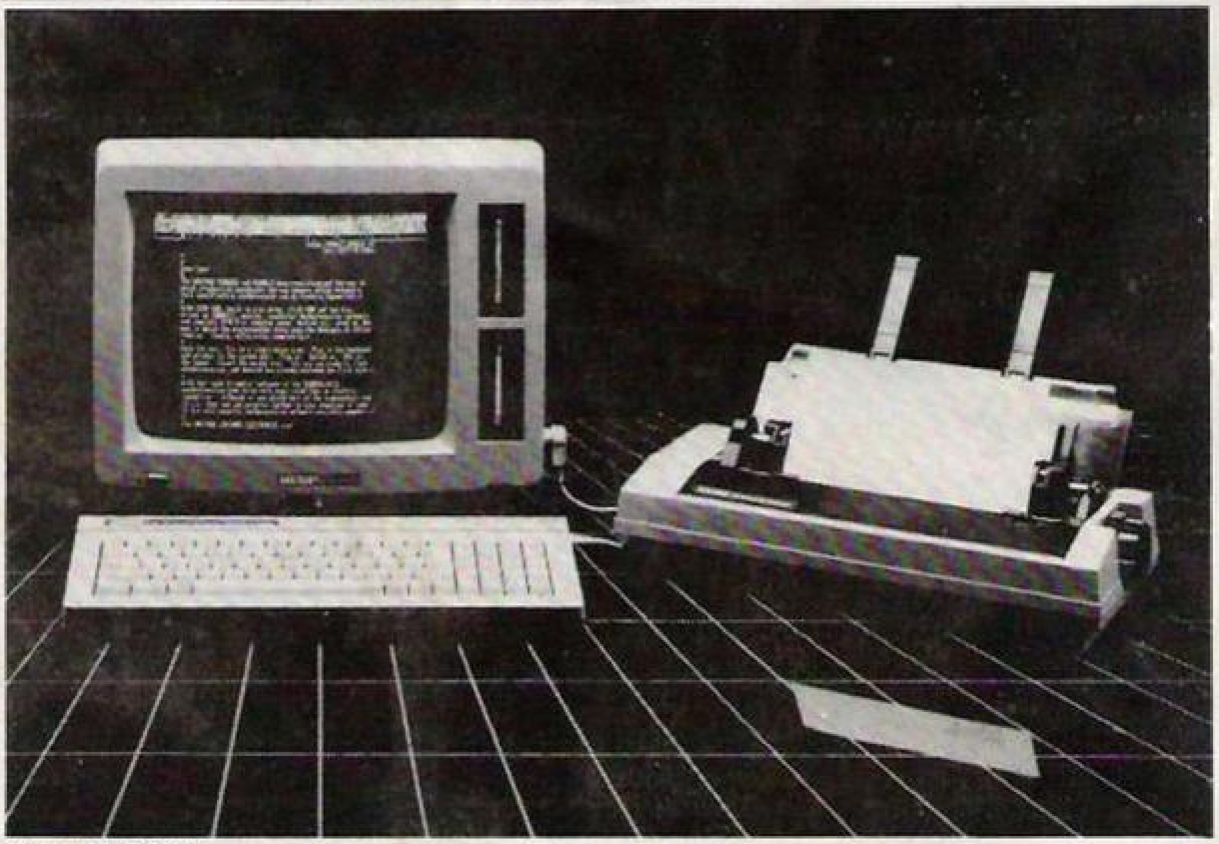
Locoscript utilities

Amstrad, in conjunction with Locomotive Software, has released two Locoscript-compatible utilities which provide the free PCW word processing program with two useful additional features, a spell-check and mail-merge ability. Peter Luke and Francis Jago assess the Loco add-ons.

The marketing of the Amstrad PCW computer can be summed-up in the by now familiar phrase "more than a word processor at less than the price of a typewriter". That claim is fully-justified by the £400 8256 system which offers a complete stand-alone WP system including keyboard and printer capable of NLQ print.

The hardware is complemented by the Locoscript WP software which, in its version 1.2 incarnation as supplied with the computer, offers an extremely versatile word processing system. While the basic function associated with the entry and subsequent editing of text is fully-supported by Locoscript, some of the additional facilities found in other word processors are missing from v1.2 of the software. The most notable omissions are a mail-merge and spell-check option.

Those omissions from the basic word processing software have been rectified with the release of version 1.3 of Locoscript which has a mail-merge function and, most recently, with version 1.4 which builds-in the ability to check the spelling of a Locoscript document.



Amstrad PCW.

Personalised letters

While utilities offering those functions have been available for some time, all such packages operated in a CP/M rather than a Locoscript environment. That has meant that to use either a mail-merge or spell-check function the user had to create an ASCII file from the Locoscript document and operated on that version of the file. The necessity to translate documents into ASCII format means that such packages are often cumbersome in operation. Both *Locospell* and *Locomail* operate in a Locoscript environment, the options being available from the f7 options menu from the editing text screen.

The Locomail mail-merge program allows users to create automatically personalised versions of a standard letter produced by Locoscript. It is the ability to create such letters automatically which gives Locomail its power. The manual describing the use of Locoscript v1.2 shows that by use of the reverse video fields and sensible prompts it is possible to use the standard version of Locoscript to produce simple form letters. Such a process is rather inelegant, since the user must take care to erase any prompts after entering the information specific to a particular letter. Locomail automates the process of data entry, greatly speeding the process of producing a mail-shot.

Version 1.3 of Locoscript adds two mail-merge-related options to the main disc management screen. They are F and M, the letters referring to the fill and merge operations. Like the other functions available from the main menu screen, the operations are selected by pressing the key corresponding to the initial letter of the command.

To use Locomail to create a set of personalised letters it is necessary to prepare a standard version of the letter into which data may be merged. Such letters are prepared as a standard Locoscript document with the addition of an extra mail-merge-specific command, that command being Mail.

The command is selected in the same way as the familiar Locoscript commands, either by selecting the option from the sub-menu which appears when the + key is pressed or, for greater speed, pressing the + key followed by the m key. As with other such commands, the (+mail) command is paired with a matching (−mail) command.

Prompt string

Between the Mail command pairs the user may enter a number of Locomail commands and prompt strings which will appear on-screen during the mail-merge process. Locomail supports an

extensive range of commands, although many users will use only the ? and ; options which are placed before any text which is to form a prompt string.

Having created the master document, the user may select either a direct mode of operation in which the data fields, from part of the standard letter, are filled from the keyboard; or an automatic mode in which the fields are filled from data contained in a data file. The first mode of operation is suited to occasions requiring only a limited number of letters to be created from a master document, the latter mode when a large number of letters are to be printed.

Data files for use with Locomail are created using Locoscript and consist of an initial entry which specifies the form in which the subsequent data is stored. A page break command separates that field from the data fields which follow. Those fields are again separated by page breaks. Locomail builds-in a number of commands which may be used to select only those entries from a data file which meet a given set of criteria.

Locomail is a powerful mail-merge program which will meet the majority of business users' requirements. Although other software packages offer a mail-merge facility at a lower price, none is so easy to use as Locomail.

How many times have you watched your PCW printer as, when nearing the end of a page, you notice a spelling or typing mistake so obvious that you have no option but to stop printing, re-edit the document, and then re-start the printing process? Even if you are a superb typist, mistakes are still made and, until now, only sharp eyes could do anything about it.



Figure 1.

Spell check

Locoscript is, considering the price of the system it accompanies, a good, solid word processor but, as anyone who has spent some time using a PC will tell you, no word processor is complete without a built-in spell-checker. With the introduction of Locoscript v1.4 with Locospell, Amstrad can claim to have made a conscious effort to silence the critics.



Figure 2.

Costing £39.95, Locospell is by no means inexpensive, especially when you consider the initial purchase price of an Amstrad PCW. When you first boot-up your system with Locospell, the initial difference is a slight change to the loading screen and the proclamation that this version of Locoscript contains a spell-checker.

The other point dedicated PCW users might notice is that this version takes longer to load, because some of the loading time is spent copying the 32,000-word dictionary from drive A to drive M, to speed the spell-checking process once the program is in use.

Once you are editing a document, you can start to use the various additional options Locospell provides. Pressing f7 now brings up not only the Editor sub-modes but a new series of options called Check spelling. This option has four choices – figure one – All of document, Just forwards from here, Single word, and User dictionary upkeep. To test the ability of the spell-checker, Locomotive Software has included a short document, MISTAKE.EG, which includes some very obvious mistakes. If you initiate a check of the whole document, Locospell will soon find the first mistake and will then give you a new series of seven options – figure two.

If Locospell has found a word which you have spelt incorrectly, it will give you an alternative word, which may or may not be correct. Because Locospell allows you to consult its dictionary, most of the time it is possible to find the correct spelling of a word. If Locospell finds a word it fails to recognise, it will again allow you to change it, but this time it is more sensible either to mark the word correct, in which case it will ignore it throughout the rest of the document, or add it to the user dictionary.

Saving essential

Once finished, a menu will appear telling you how many words Locoscript has checked – in effect, the added bonus of having a word count – and how many words it has added to the dictionary. In use, it is generally necessary to add a few words to the dictionary to ensure that it is soon personalised to your needs, so saving your own dictionary after each day's use is essential.

Once you have Locoscript V1.4, with Locospell, you will wonder how you managed for so long without it. It is fast – it needed only one minute 20 seconds to check this article, including five errors – and is very easy to use, and PCW8512 owners also have the bonus of being able to use the extended 77,000-word dictionary provided on side two of the dictionary disc.

It is good value and must be considered an essential purchase for anyone who writes lengthy documents frequently.

WIN A HIGH-QUALITY THOMSON MONITOR TO COMPLEMENT YOUR COMPUTER

Many hours spent using your computer in front of a television screen poses two problems. First, the picture is never as good as you would like and, second, what if mum wants to watch EastEnders?

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To win, answer the three questions below and send your answers, together with which computer you own, to *Your Computer*, 79-80 Petty France, London SW1H 9ED.

The winners will be the first correct answers drawn from all those received by the closing date of the competition, the last working day in February.

QUESTIONS

1. *Which electrode is responsible for the brightness of a screen?*
2. *Which computer priced at less than £500 has the highest colour screen resolution?*
3. *Name the substance responsible for creating the image on a monitor?*





COMPETITION RULES

- ★ The winners of the competition will be the first two correct answers drawn from all those received before the closing date of the competition.
- ★ The names of the winners will be announced in the May 1987 issue of *Your Computer*.
- ★ All entries must arrive at the *Your Computer* offices by the last working day in February, 1987.
- ★ Each person may enter the competition only once.
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THOMSON COMPETITION

Do not forget to enclose this coupon, or a photocopy of it, when you send your entry, marked Thomson Competition, to the *Your Computer* editorial offices at the address shown at the front of the magazine.

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Address ____________

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This chart is based on the *MicroScope* chart as compiled by Gallup.

MicroScope GALLUP

MicroScope is the weekly trade paper of the microcomputer industry. If your computer store doesn't display the latest *MicroScope* chart, ask the manager to call Mark Salmon on 01-631 1433 — we'll send a copy every week.

THE CHARTS

TOP 20

1	PAPERBOY	ELITE	SP CO
2	COMPENDIUM OF HITS 10 VOL. 3	BEAU JOLLY	SP CO AM AT BB C1 EL MS
3	TRIVIAL PURSUIT	DOMARK	SP CO AM AT BB C1 EL MS
4	SCOOBY DOO	ELITE	SP CO AM
5	KONAMI'S COIN-OP HITS	IMAGINE	SP CO AM
6	BREAKTHRU	DATA EAST – U.S. GOLD	SP CO
7	FIVE STAR GAMES	BEAU JOLLY	SP CO AM AT C1 B8 EL MS
8	COBRA	OCEAN	SP
9	THEY SOLD A MILLION (3)	HIT SQUAD	SP CO AM
10	INFILTRATOR	MINDSCAPE – U.S. GOLD	SP CO AM
11	THE GREAT ESCAPE	OCEAN	SP
12	REPTON 3	SUPERIOR	BB EL CO
13	WORLD GAMES	EPYX – U.S. GOLD	CO
14	FOOTBALLER OF THE YEAR	GREMLIN GRAPHICS	SP CO AM MS
15	KONAMI'S GOLF	IMAGINE	SP CO AM
16	HEAD COACH	ADDICTIVE	SP CO
17	GAUNTLET	U.S. GOLD	SP CO AM
18	DRAGONS LAIR	SOFTWARE PROJECTS	SP CO AM
19	URIDIUM	HEWSON CONSULTANTS	SP CO
20	AVENGER	GREMLIN GRAPHICS	SP CO AM

BUDGET TOP TEN

1	180	MASTERTRONIC	SP CO AM
2	OLLIE AND LISA	FIREBIRD	SP
3	NINJA MASTER	FIREBIRD	SP CO AM AT
4	HAPPIEST DAYS	FIREBIRD	SP CO
5	THRUST	FIREBIRD	SP CO AM AT
6	AMERICAN FOOTBALL	BUGBYTE	SP CO
7	BOMB SCARE	FIREBIRD	SP AM
8	ALIEN	MIND GAMES	SP CO
9	BMX SIMULATOR	CODE MASTERS	CO AT
10	KAI TEMPLE	FIREBIRD	SP

BUBBLING UNDER

SHAO-LIN ROAD	THE EDGE	SP
FLASH GORDON	MASTERTRONIC	CO
STAR GLIDER	RAINBIRD	SP AT AM
SENTINEL	FIREBIRD	CO
VAMPYRE	CODE MASTERS	SP AM MS
SPACE HARRIER	ELITE	SP
MICRORHYTHM	MASTERTRONIC	CO
PRO SNOOKER	CODE MASTERS	SP AM
ACADEMY	CRL	SP

MACHINE CODES:
SP = SPECTRUM; CO = COMMODORE; AM = AMSTRAD; MS = MSX; AT = ATARI; V2 = VIC20

Bobby hits the Con

obby Bearing, the best
ame yet inspired by *Marble*
Madness, is finally available
or the Commodore 64.
raphically almost identical to
e original Spectrum version,
e game is still just as
ayable. The object is to
uide your marblesque
aracter round a maze until
can find and rescue your



You are the law

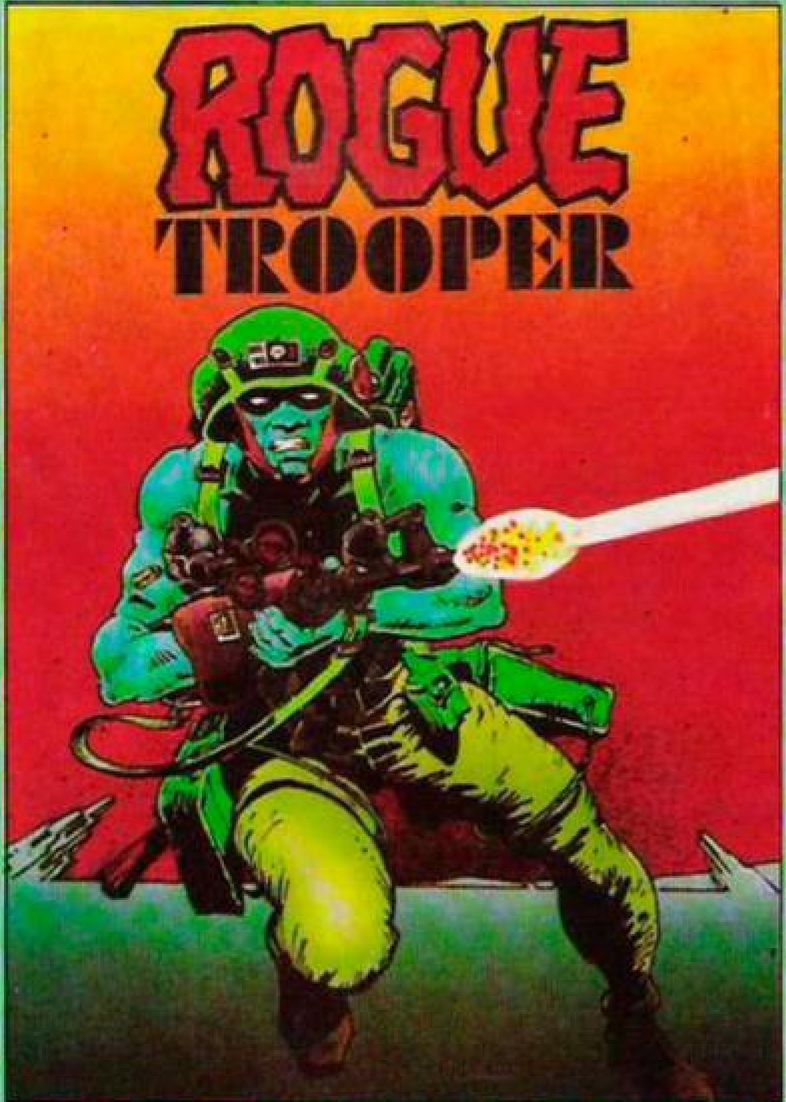
If I were a software house and had the choice of any licensing deal on earth, there would be two cartoon characters at the top of my list, *Silver Surfer* and *Judge Dredd*. No-one has yet got the enigmatic Surfer but Melbourne House has just released a game based on the life and times of that veritable Clint Eastwood of Mega City 1, Judge Dredd.

Released first on the Commodore 64, the game allows you to act your "one move and you're history, PUNK" fantasies to the full. Including many features from the now legendary comic strip, the game looks set to be a firm favourite with dedicated Dredd fans.

More 2000 AD

One month all is quiet on the comic licence front and the next *Judge Dredd* and *Rogue Trooper*, two of the most awe-inspiring cartoon heros of all time, are released as computer games in the same month. In Rogue Trooper, you take control of our trigger-happy, blue-skinned hero as he tries to track the traitor who betrayed you.

If you manage to achieve that, your buddies will be returned to life and the world will be able to live safely again. Released by Piranha, the company responsible for *Trap Door*, at first glance – that is all I have seen of it – it looks excellent graphically and seems to even keep reasonably close to the storyline.



Shoot for the stars

If graphics are important to you and you own a Commodore 64, the latest game from English Software should be up your street. Called *Leviathan*, and due for release in the last week of January, the game is a shoot-em-up which involves navigating your ship through three planet zones, with 10 alien attack waves on each planet.

It features a two-way, diagonally-scrolling landscape and a ship which can bank, roll, climb, and land to re-fuel. With the ability to fly behind all the objects you can see on the screen, with realistic perspective and a great deal to shoot, the game promises to be a modern-day *Zaxxon*.

Another thing in favour of Leviathan is music and sound effects by that 'junior Hubbard', David Whittaker. If it is as good as the screenshots suggest, it really will be worth waiting for.





SUPERTEC COMPU

This chart is b

MicroScope

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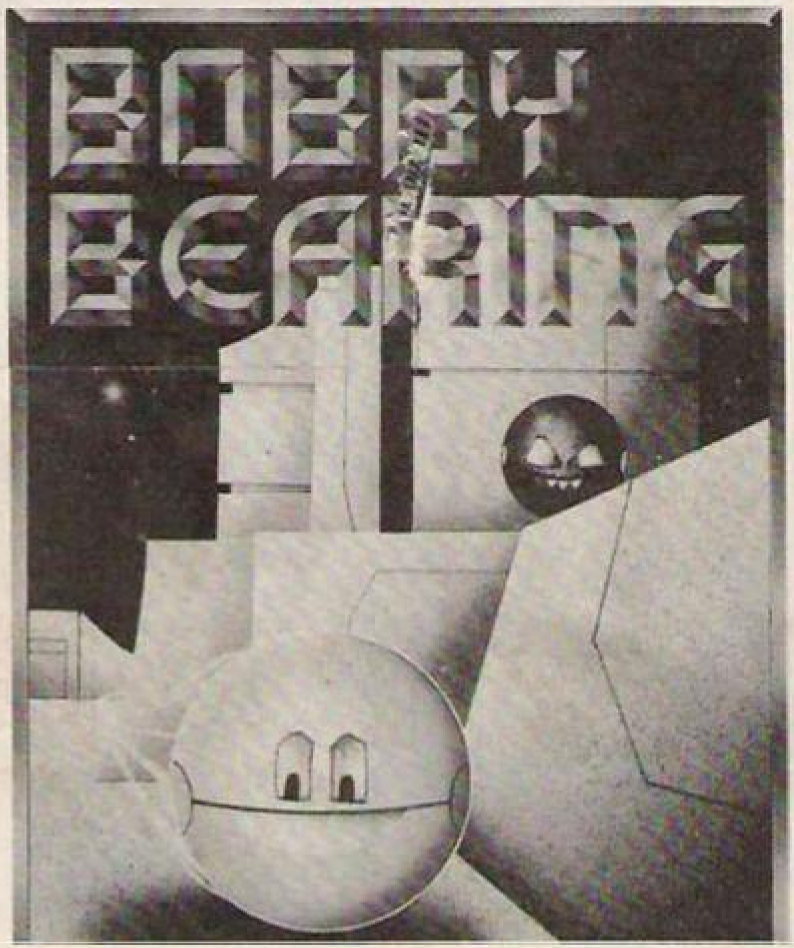
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Bobby hits the Commodore

Bobby Bearing, the best game yet inspired by *Marble Madness,* is finally available for the Commodore 64. Graphically almost identical to the original Spectrum version, the game is still just as playable. The object is to guide your marblesque character round a maze until you can find and rescue your cousins.

To add to the Commodore version, the game has a pleasant little soundtrack and it continues as you worry about all the various puzzles. What makes the game so good, and especially so on the Commodore, is the detail which has gone into the creation of the character. You can almost feel the agony as Bobby is squashed by yet another lift.

If you liked *Spin Dizzy* but felt the idea could have been developed further, then Bobby Bearing is for you – it is fun, fast and infuriating.



Double fun from Hewson

If you own a Commodore 64 and can, from somewhere, obtain £8.95, here is what you do. You run – walk and you might be too late – to your local computer shop and buy a copy of the *Uridium/ Paradroid* double pack. Even if you own the originals, Andrew Braybrook has put sufficient new touches to make both games even better.

Paradroid runs 50 percent faster than the original and consequently is even more playable and as for Uridium – well, new attack waves, new Dreadnoughts, more difficult gameplay, and the ability to land anywhere on the runway means this master-blast is now back up there with the best.

More good news is that Hewson has also finished *Firelord* for the Commodore, so 64 owners can now play Steve Crow's latest mega arcade adventure.

Tracking success



Following the incredible success achieved by *Starglider,* Rainbird has just released its latest game. Called *Tracker,* it is a science fiction-type strategy game based on an attack on a Centrepoint complex on Zeugma IV. Using maps, and a great deal of cunning, you must fight a highly-intelligent computer opponent in a network of trenches arranged into 22 sectors.

As is now usual for Rainbird games, Tracker is complete with a players' guide and Novella.

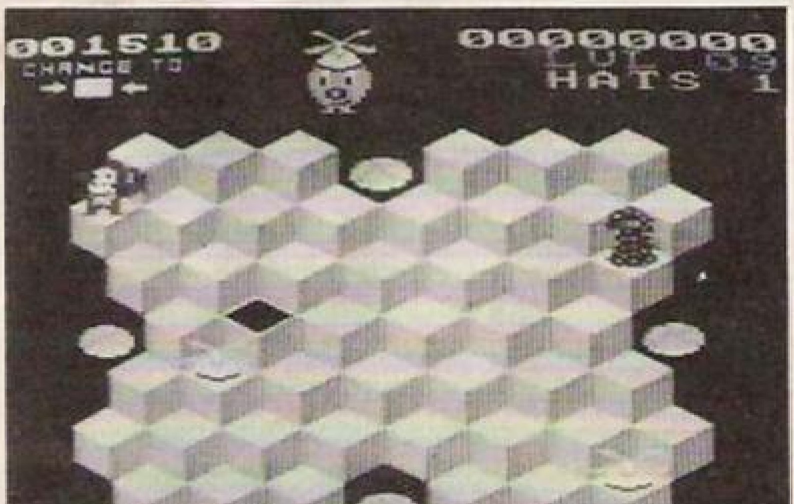
In this case the Novella, called Centrepoint, was written by an employee of Firebird, Mike Anderiesz, and surprisingly good it is, too.

If you are a fan of good strategy games, then this one, programmed by Union Software, should be a sure-fire hit but be prepared to spend a few days getting into it before seeing any results.

ER*BERT returns

Fans of *Slinky,* the original pyramid-filling game, those who own Amstrads will be pleased to learn that a small software house, Microbyte, has released a similar game for its computers. It features 10 levels of play, multiple screens and an excellent build game scene facility.

Best of all, however, is the price, £2.99. It is a real bargain.

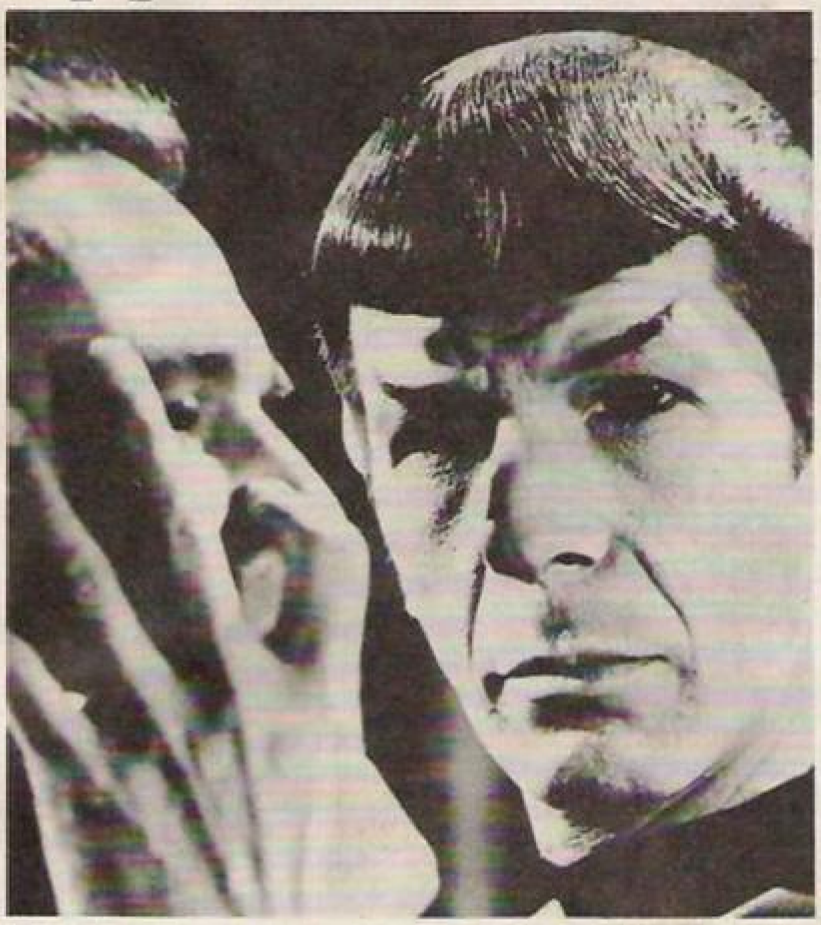


Tandy price reduction

Priced originally at £350, Tandy has reduced the price of its Racal 2123 intelligent modem to £75. Although Tandy admits the original price was unrealistic, it says the main reason for the reduction was because the product was not right for Tandy customers – no switches and controls.

No-one is complaining about the new price, which makes the 2123 the cheapest intelligent V21/23 modem on the market by a wide margin.

V22 Kirk modem approved



The BABT modem-testing procedure seems to have improved greatly. Only last year Kevin Kirk, of Kirk Automation, among others, was complaining bitterly about the delays experienced in getting budget modems to the market complete with green stickers.

Four months ago the Enterprise 1 modem from Kirk – V21/23 – was approved with the minimum of fuss and now its most ambitious product yet, the £250 1,200/1,200 full duplex – V22 – Enterprise 2 has also been approved and production has begun.

That is good news for Kirk, as it almost coincides with the arrival of the BT Vascom network which will allow V22 and V22bis – 2,400 baud – access to Prestel. Incidentally, another modem to have gained approval recently is the rival Pace £140 Linnet V21/23 Hayes-compatible modem.

Later this year Kirk plans to reveal a smart Hayes-compatible version of the Enterprise 2, the unimaginatively-named Turbo.

Clydesdale home banking

Home and business users of Clydesdale Bank will soon enjoy on-line banking. Although not accessible via Prestel, as the Bank of Scotland/Nottingham Building Society forerunners are, the Clydesdale system, Telebank, will still be a viewdata-based service.

Smaller and provincially-based banks obviously rate on-line home banking as a marketing advantage to narrow the gap with bigger banks with many local high street branches nation-wide.

AaronFay stepping up

AaronFay Ltd, another small modem manufacturer, is expecting BABT approval for its attractive little Trinitas Phasor 2221 modem this month, though the main news from the Ipswich-based company is the release of an ST-based comms package dubbed *Frontgreen*. The £39.95 package features full modem compatibility with the Phasor modem but can also be configured easily to control other smart modems such as the Miracle WS4000.

Full viewdata and ASCII scrolling text options are featured. The ST now looks very well catered for in terms of comms software, with at least five major comms packages available, and could eventually take over the BBC micro comms crown.

BT clamps down

Hackers beware. BT is clamping down on alleged mis-use of PSS accounts. In Port Talbot recently, comms enthusiast and freelance journalist Paul Needs was arrested and later charged under Section 13 of the 1968 Theft Act in relation to alleged mis-use of a PSS account.

The charges are on four counts of abstracting electricity belonging to BT by the alleged use of a PSS account belonging to BT Sales.

Needs was bailed to appear at Port Talbot Magistrates Court on January 21. In the meantime, the defendant's computer equipment, an Amstrad 6128 and Nightingale modem, have been confiscated by the police.

£50,000 pledged

Prestel and Micronet were involved again in the BBC Children in Need Telethon appeal. The amount raised from on-line donations in 1985 was almost £8,000. In 1986 a staggering £50,000 was pledged as a result of the Prestel/Micronet effort, with a link to Britain's network of local Information Technology Centres.

In addition to credit card donations and mailbox pledges, Micronet repeated its successful on-line charity auction. Highlight of the bidding was £1,570 for an Acorn ARM – Acorn RISC machine – second processor donated by Bob Coates of Acorn. In addition there were five Celebrity Chatline interviews with various passing stars, such as "Superman" Christopher Reeve.

The next charity event to be covered on-line will be the Capital Radio Help a London Child Appeal this spring.

What should you do on confronting an onion or a unicorn? Also, what can a bandworm do extremely well? Roger Garrett reveals all.

Problem-solving aids for Quest

The release of the Level 9 *Jewels Of Darkness* has begun to cause a few problems among adventurers and reports form the helpliners suggest that many of the pleas for help concern this trilogy. It is not surprising that some are stuck on the second game, *Adventure Quest*. I remember talking to Margaret Austin some two years ago and she informed me than that of the three AQ had been the worst seller. Now it seems it is the most-played game of the three, or the most difficult, so here is a brief run-down on how to get started and proceed further into the game.

The first thing we notice is a white dot above the door. Do not attempt to do anything there – you will find its purpose later in the game. Take the table instead and go to find an orchid. The onion rolling on the ground is, in fact, a garlic. Leave it in the hut for later, give the orchid to the Unicorn and then follow it to find the pipes and talisman. The pipes are very useful when confronted by a serpent.

Search the forest for a climbable tree and take the silver ball. Before you attempt the desert make sure you have explored the area round the first few locations and met the wizard.

The bandworm, you may think, is something of a pest but remember it will clear anything in its path, so time your moves properly and a troublesome Sphinx will trouble you no more. Removing the Sphinx allows access to the temple. If you have done your Aladdin bit, remembering what I said earlier should give you the means to destroy a black nameless shape and enable you to get what is needed for the bjinn – not necessarily in that order.

Further up the mountain two obstacles are set before you. One can be solved by slinging something shiny; the other needs the help of an accomplice who, when released, will help you to move some boulders. I hope that will help some people to move in the proper direction but there is still much more to do before completion.

READERS' CORNER

Stefan Rooyackers in the Netherlands sends a plea for help. At the moment he is stuck in *Ultima III*. He would like help on where to find the Mark of the Snake. Also for what is the powder used? He would also like to get in touch with any English IBM-PC users.

Graeme Sibson would like as much help with the Mastertronic *Zzzzz* while John Petit is still trying to find the steel key in *Secret of St Brides*.

Stanley Cox is asking for help on the Mastertronic *Spellbound*. I do not know what many of you think but surely Spellbound is an ardvark, isn't it? Anyway, as we are a kindly bunch of adventurers I am sure somebody can tell Cox how to find Thor's Hammer.

Petre Yvan from Belgium thinks the new-style adventure section is very good and then asks about various adventures. First, in *The Dark Crystal*, how does he get the vine and cross the ravine. Second, does anybody know anything about *Buckaroo Benzai*, in particular the Bauxite and Catalysator?

Congratulations to Bill Wernham of Invergarry. To my knowledge he is the first person to complete the Infogrames *Vera Cruz* successfully and to prove it he sent the full solution. He also mentions the pitfalls of buying mail order games. It seems he bought a faulty disc game from a company which failed to replace it. After making various telephone calls he is now £14.95 out of pocket for the game, plus the cost of the calls.

On a happier note he expresses thanks for the help and advice he has received from our Helpliner Jackie.

Is there anyone who can help Kelly Medori, who lives in Milan and is trying desperately to get out of an aircraft in *Infinite Inferno*. It is an adventure of which I have never heard, so any help would be appreciated.

HELPFUL HINTS

Castle Blackstar
To get Sword from stone, Carry 'Crown' and 'Sceptre'. To overcome 'The Angel of Death', on entering chapel immediately enter 'Pentacle' then read 'Scroll'.

Enchanter
Use the 'Gondar' spell on the Dragon; drop the light before entering the Gallery.

Project X Micro Man
To leave car, examine car, climb seatbelt, wind handle; Haystack maze, S/W.S/W. E.N/E.E.S/E.(get needle)N.E.

Masterclass
To get started, get the 'watch', climb 'wallbars', read 'graffiti',D, examine 'watch'. Push button on watch, note alarm setting – convert this to 24-hour time – read wall chart in the History room, then find who came to the throne in that year.

Pyramid of Doom
To find the 'Diamond Necklace', saw table.

Enthar Seven
To pass the plant with tentacles in section 5, pour poison.

Dracula
To find the light you must have slept for at least three nights in Dracula's castle.

Cuddles
To escape from playpen, get bowl then Drop bowl.

HELPLINES

Geoff Rens is unable to continue with the helpline service due to other commitments, which leaves an opening for someone who feels they can continue where he ceases. If you would like to do a helpline service and know a good deal about adventures, write to me but remember the Helpline service is voluntary.

Jackie is still available on 061 339 0092 for instant help or you can write to Roger Garrett's Adventureline, c/o Your Computer, 79-80 Petty France, London SW1H 9ED.

Briefly . . .

There is a definite shortage of good adventures available at the moment but *Apache Gold* and *Winter Wonderland* are now available direct from Incentive – reviewed this month – with *Axe* and *The Ket Trilogy* following soon.

Also set for imminent release from Mastertronic is the sequel to *Sep Kaa Of Assiah* entitled *Kobay Afhi Naru* which sounds like an Indian curry – along with another in the *Magic Knight* series called *Stormbringer*.

I also learn of a new role-playing game from the authors of the *Ultima* series, called *Morbeus*. It is "set to reach new dimensions in RPGs" and that's saying something considering the earlier series.

TRINITY

- ► *CBM128/Amiga/Atari/ST*
- ● *Activision/Infocom*
- ● *Text Adventure*
- ● *About £30*

Suddenly there seems to be a spate of Infocom adventures. That is good news for those who are Infocom fans but let us hope that quantity does not overpower quality. I was not too impressed with *Leather Goddesses* after I had played through it but *Trinity* is excellent. Written by Brian Moriarty, author of *Wishbringer*, it centres on a fairly controversial subject, war and the H-bomb. That is not to everyone's taste but for those without nuclear bias the game is very enjoyable.

The story begins just before the start of World War III. Playing the part of a American tourist, it is your last day in London. Unfortunately if you do not solve

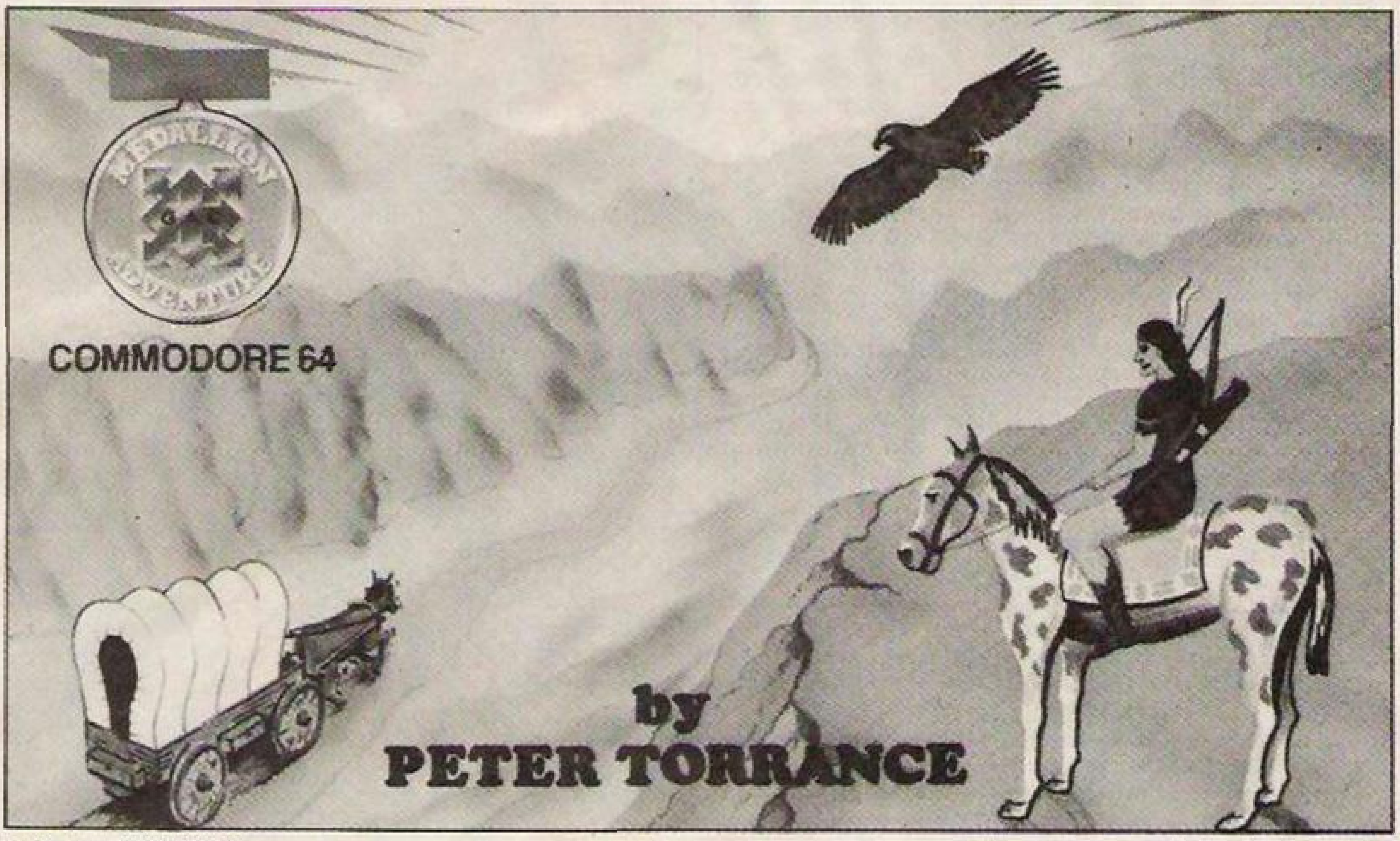
GRAPHICS
None
ATMOSPHERE
● ● ● ● ●
PLAYABILITY
● ● ● ● ●
VALUE FOR MONEY
● ● ● ● ●
OVERALL
● ● ● ● ●

the first stage of the game quickly you and the city are vaporised by the explosion of an H-bomb. There is only one way to escape that ultimely death, by entering into another dimension/s.

That is achieved by finding and entering seven white doors which will project you to each of the different stages of the game, there to find certain objects and eventually defuse the bomb, but I am hopelessly stuck at the moment.

Once again, as in Wishbringer, Moriarty blends the real world with the fantasy of his special imagination and the result is everything one could wish. For now you will have to excuse me while I try to figure out what to do with an icicle which keeps melting; and why does that large boy keep blowing bubbles at me?

APACHE GOLD



- ► *Spectrum 48K/CBM64*
- ● *Incentive Software*
- ● *Text Adventure*
- ● *£7.95*

We have seen a few adventures written on the GAC but this is the first of two new releases on the new Incentive adventure label Medallion, the other being *Winter Wonderland* which I was hoping to review but had loading problems with. *Apache Gold*, written by Pete Torrence, the man responsible for baffling us with *Seabase Delta* and *Subsunk*, sets you firmly among ancient tribal burial grounds, hot dry deserts and other equally disturbing locations as you endeavour to find if there is any truth in the legend of Apache Gold.

GRAPHICS
● ●
ATMOSPHERE
● ●
PLAYABILITY
● ●
VALUE FOR MONEY
●
OVERALL
● ●

In your trusty old wagon, a quick flick of reins and off you trot into the wild west but it is not long before a band of unfriendly Apaches attack and take you prisoner. After solving an infantile problem you make your escape and travel to the nearest town, there to collect sundry items which will help you to progress further towards your goal.

Having played and enjoyed Torrence's earlier games I was a little disappointed with this. The problems are very basic and do not take any figuring out. The graphics, which were very good in the previous releases, are of the type we saw in very early adventures and do little to add anything to the game.

If Incentive intends to make a name in the adventure market, releasing games like this at top prices will do little to enhance its reputation. At £1.99 the game would have been passable but at £7.95 I feel many people will pass.

DODGY GEEZERS

- Spectrum 48K/CBM64
- Melbourne House
- Text Adventure
- £7.95

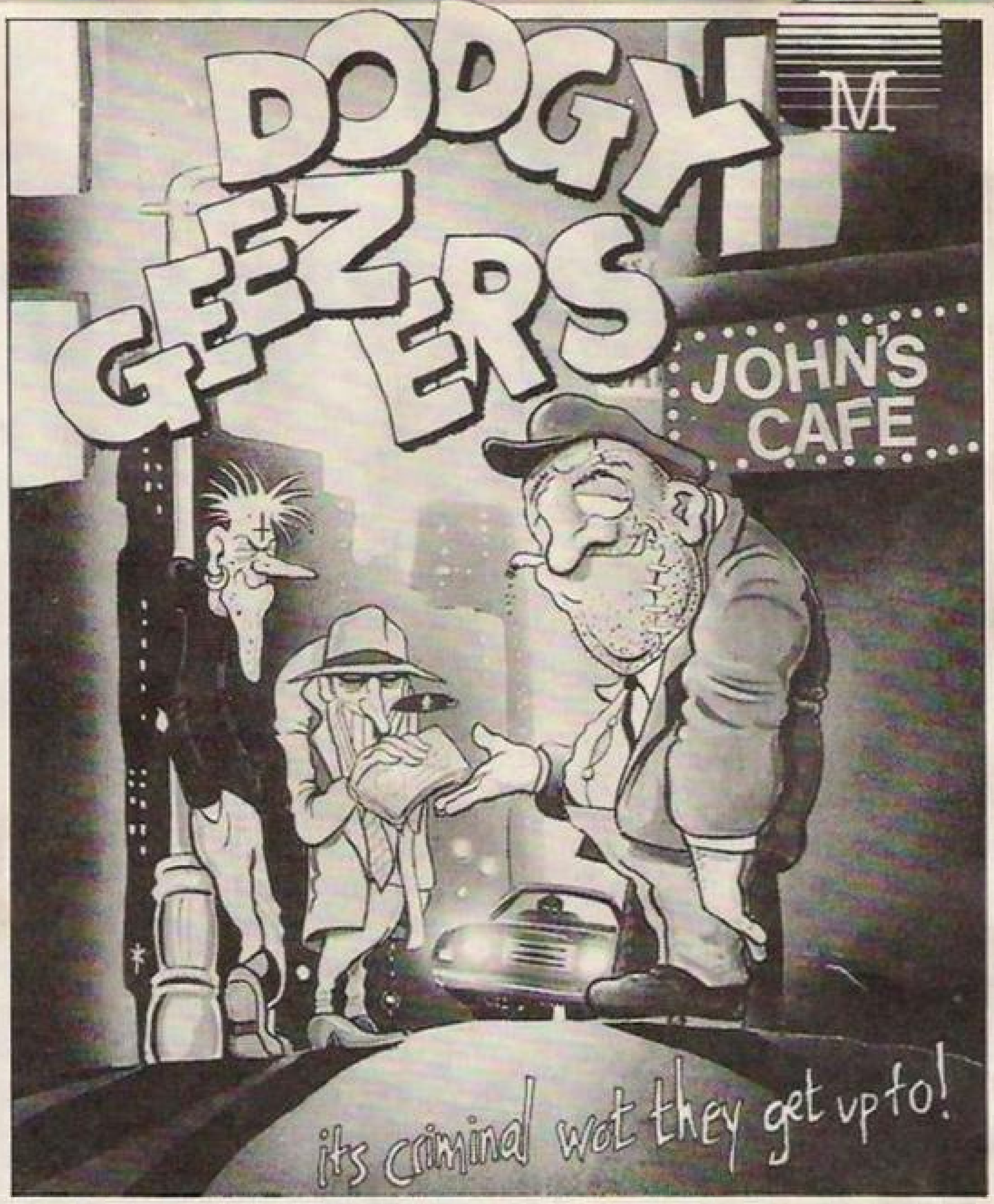
After serving three years locked in one of HM prisons for your part in the Long Ditton Spaghetti Caper, it is good to be free again. The first thing in your mind, naturally, is to plan a caper which will not go wrong and then it is off to the Costa Brava for a life of luxury – or at least that is what you hope.

As any budding criminal knows, the first thing to do is to formulate a plan then recruit the various seedy characters needed to operate it. Meeting an odd assortment of people and gleaning information from them will help you in your task.

GRAPHICS
● ● ●
ATMOSPHERE
● ●
PLAYABILITY
● ●
VALUE FOR MONEY
● ●
OVERALL
● ●

Having recruited your gang, you will be able to load part two and attempt to realise your dream.

So much for the plot but what about the gameplay? Trevour Lever and Peter Jones of *Hampstead* and *Torrormolinos* fame have endeavoured to give us something a little different but once again I feel they have fallen into the same rut as other writers. Instead of creating a good atmosphere with interesting text descriptions they have instead opted for a number of meaningless locations and bland graphics. Much of the humour failed to make any impact on me and I soon began to become disenchanted. For those who played the earlier games and enjoyed them, this one should suit you.



KAYLETH

- Spectrum 48K/128 CBM64
- U.S. Gold/Adventuresoft U.K. Ltd
- Text Adventure
- £9.95

Kayleth is the first adventure from the AdventureSoft new Isaac Asimov Science Fiction Magazine series. Written by Stefan Ufnowski, the story centres on the peaceful Zyroneans, an advanced and civilised race, but because their planet is rich in a rare mineral called Chromazin, their world is attacked by the all-powerful *Kayleth* and his awesome army of Droids.

Soon the Zyroneans are enslaved by Kayleth and sent to work in the subterranean caves to extract the precious mineral which Kayleth craves. You are a loyal Zyronean. Having managed to stay free from the Droids' clutches, you are the only remaining hope. You vow to rid your planet of this evil leech but before you can begin your task something strange happens; everything goes black, your mind struggles to release itself from this endless void, you wake to find yourself brainwashed, strapped to a table moving ever closer towards a pair of steel claws which descend rhythmically and emit a blue light.

GRAPHICS
● ● ● ●
ATMOSPHERE
● ● ● ●
PLAYABILITY
● ● ● ● ●
VALUE FOR MONEY
● ● ● ●
OVERALL
● ● ● ●

Your first instinct is to survive. A distant memory flashes through your confused mind – save the planet – but try as you may your thought patterns are jumbled and unreal.

AdventureSoft has done it again. Taking an excellent story, it has turned it into an excellent sci-fi adventure, combining atmospheric text descriptions with good-quality graphics, some of which are animated. Mike Woodruff's team has produced another thought-provoking adventure which starts at a cracking pace and very rarely eases to let you catch your breath while you race about, trying not only to find your own identity but also the means to defeat a powerful foe. Good, logical problems, coupled with a large vocabulary, will keep most adventurers busy for a long time.

Letters

Faulty repairs



I am writing in desperation. A nightmare incident has been continuing for more than a year now. I feel that potential Master 128/Compact buyers should be aware of it, because the situation in which Model B owners find themselves is how Master owners will find themselves in a few years.

I refer to the vitally essential aspect of after-sales service. If people are expected to pay more than £400 for a micro, they are entitled to a competent network of repair facilities and user support. A year ago, my Model B developed a DFS fault. The BBC refused to access the disc. I took the micro to a recommended repairer, because Acorn does not provide repair facilities. After spending more than £60, the problem was not solved. After much frustration and wasted time, I wrote to Acorn. I was told not to worry and given another address of a recommended repairer. I sent my micro. Months passed. I wrote to Acorn asking if it could provide information as to how the repair was progressing, since the company did not answer my letters. I was provided with a telephone number, which I rang, and my computer was returned many weeks later. A ROM was not returned with it and it was weeks before the company returned it.

The ROM board was disconnected so that it would not be damaged in transit. When I re-connected it, it would not work. I returned it twice more and after each return it failed to work. In desperation, I sent it to Acorn, which now says it has not received it.

I do not blame Acorn for the faulty repairs directly but I blame Acorn for not providing the all-essential bare necessity of a return-to-manufacturer repair facility.

The general attitude of Acorn has not been at all satisfactory. Many people, including those who write to your magazine, have said how long it takes before replies to enquiries have been answered – or not answered at all. I had planned to buy a Master but, as typified by the Acorn second processors, Acorn seems to care only about selling, not supporting. After all the expense I cannot afford to upgrade and I am left with a machine which I use for serious work running at only 50 percent capacity. Is this the attitude of a company which plans to sell micros each worth many hundreds of pounds? Does Acorn care about user support? I hope for the sake of Master purchasers it does but I remain unconvinced.

I. S. Gibson,
Maidstone, Kent.

Conversion complication

Recently I bought *Tomahawk* for the Amstrad CPC464. The game included Lenslok which is impossible to use with a normal television set so I cannot play. Could you advise me?

W. Cartmill,
Rathfriland,
Co. Down.

Editor's reply: To use your CPC with a television set you must be using a modulator to enable the system to work. That is why the television will not work with the Lenslok. Presumably you have an Amstrad green screen monitor and, sadly, you will have to resort to it to play the game. Failing that, if you can afford to buy an Amstrad colour monitor, you will get the desired effect.

Can readers help?

While in Pretoria, South Africa, during August, 1986, I managed to buy a second-hand Seikosha GP-250X printer with an interface assembled by the previous owner.

My requests to the supplier seeking information on the interface appear to have been ignored. In the circumstances, I am enclosing a rough sketch of the interface concerned and wonder if some knowledgeable person could tell me what interface it assimilates so that I can get OCPs "+ 80" programs to print at 80 columns.

Also please help me to prepare a customised copy of Tasword Two. What codes do I need to type-in and what key would I eventually have to press to get the printer to print what I have typed?

As an old-timer, and slow to learn new tricks, I shall be very grateful if any explanations can be as descriptive as possible without being too technical.

E. I. G. Muir,
Bulawayo,
Zimbabwe.

Editor's reply: We are unable to help with this query but one of our readers may be able to solve your problem.

MAN LOGIC

By NEIL BRADLEY



PCW or ST?

I write to complain as a potential purchaser of the Atari ST computer that you were unfair to this machine in your Christmas appraisal although, elsewhere in the December issue, Stephen Applebaum gave a good report of one of the many software programs for the ST when he reviewed *Art Director* from Mirrorsoft which costs only £50 against more than £100 for *Deluxe Paint* on the Commodore Amiga.

To be precise, it is your last few words with which I quarrel, when you stated that while the ST can be used in business applications, the Amstrad PCW and 1512 provide higher performance at better prices.

On the contrary, the ST has the advantage of having the GEM operating system in ROM, so that it does not have to be loaded from disc and takes no RAM.

There is a wide range of excellent value business software speciall designed by firms like Kuma Computers and others to take full advantage of the GEM environment.

Also the ST has three custom chips to reduce the load on the excellent Motorola MC 68000 CPU, plus the fact that an Amiga-style chip costing £60 plus VAT can now be fitted.

Regarding Kuma, it is specially worthy of mention because it aims to provide an even more comprehensive range of ST-priced budget software than Psion did for the QL. Mirrorsoft has also produced *Fleet Street Editor*, which gives access to desk-top publishing at a very competitive price.

Michael Kingston,
Bristol.

Editor's reply: We stand by our conclusion that the Amstrad PCW machine provides a higher performance at better prices. While you are correct to point out the very good business applications of the Atari ST, you carefully avoid price in your argument which must, after all, be a consideration when buying a computer.

The Amstrad machine provides an efficient base with which to start. When the price of the machine is also considered it becomes the obvious choice.

Spectrum supplies

I shall be grateful if you are able to recommend a reasonably-priced, value-for-money disc drive which I could use with my Spectrum+. Suppliers' names and addresses will be extremely helpful. I would also like to have the name(s) and address(s) of supplier(s) of Taxan 14 three-colour screen monitors – green, amber and normal.

E. E. Mort,
H.M. Diplomatic Service,
British Embassy,
Helsinki, Finland.

Editor's reply: It is always difficult to recommend a piece of hardware, particularly when no price range has been specified. If you contact Opus Supplies it will be able to advise you which monitor and disc drive would best suit you.

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ROLLERCOASTER SOUNDS

Owen and Audrey Bishop ride the ups and downs of glissando synthesis in a bid to improve the quality of Spectrum sound effects.

The Spectrum has always lacked really good sound facilities such as are available on the Amstrad, the BBC micro, and particularly the CBM64. Although the sound chip of the 128 Spectrum offers its owners much more than the pathetic BEEP of the Spectrum 48 and Spectrum +, it is deficient in one essential feature, a tone envelope. By that we mean that it should be possible to vary the tone – or pitch – of a note while it is sounding. Notes which slide up or down in pitch, and possibly up and down again, are what we refer to as rollercoaster sounds.

Musicians call this effect glissando. Examples include police sirens, the sound of falling bombs or the ricochet of bullets. If you are writing a games program which requires sound effects of this type, you find that the 128 PLAY command is satisfactory for generating triumphant little jingles to reward the winning player but virtually useless for producing the sound effects. No matter how hard you try, the sound which is supposed to be a siren emerges as a series of individual notes in upward and downward scales.

Gliss is the name we have given to a short machine code routine, only 56 bytes long, which you can use to produce glissando – or rollercoaster – sounds on your Spectrum. It works equally well on 48K and 128K machines. Whether you are a games programmer or not, the program is fun but warn other members of your family to wear earplugs while you try it.

When it is producing a sound effect, the Gliss routine uses a block of memory to which we refer to as a period table. It contains a series of numbers which determine the period – length of time – of successive sound waves. Think of Gliss as a tape-player and the period table as the tape which Gliss plays.

Figure one shows how the numbers in the table affect the sound produced. If all the numbers in the period table are equal, each sound wave has the same period and we obtain a sound of constant pitch. That gives a steady note similar to an ordinary BLEEP.

If the first number is small and successive numbers are larger, the note has increasing period. That gives decreasing pitch. The pitch slides smoothly downward, as in the sound of a falling bomb.

A rising pitch is obtained by starting with a large number – not more than 255, as it has to be stored in a single byte – followed by progressively decreasing numbers. Using this principle, it is possible to create a period table to give the required effect.

The Basic demonstration program *Roller* –see listing – has the code for Gliss in the form of data statements – lines 200-210. Type-in those numbers with care. When the program is run, lines 10 to 30 clear memory space to hold the period table and the machine code and put the code into memory ready for use.

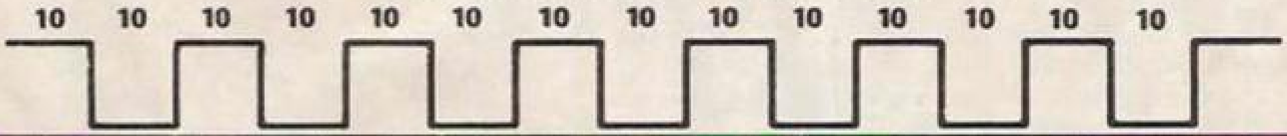
Those familiar with the Spectrum memory map will realise that the code has been located just below the region where the user-defined graphics are usually stored. Below the code, 1,000 bytes are set aside for the period table. Thus there still is plenty of room for your own games program. When using your program, use Roller as a guide to programming the sound effects.

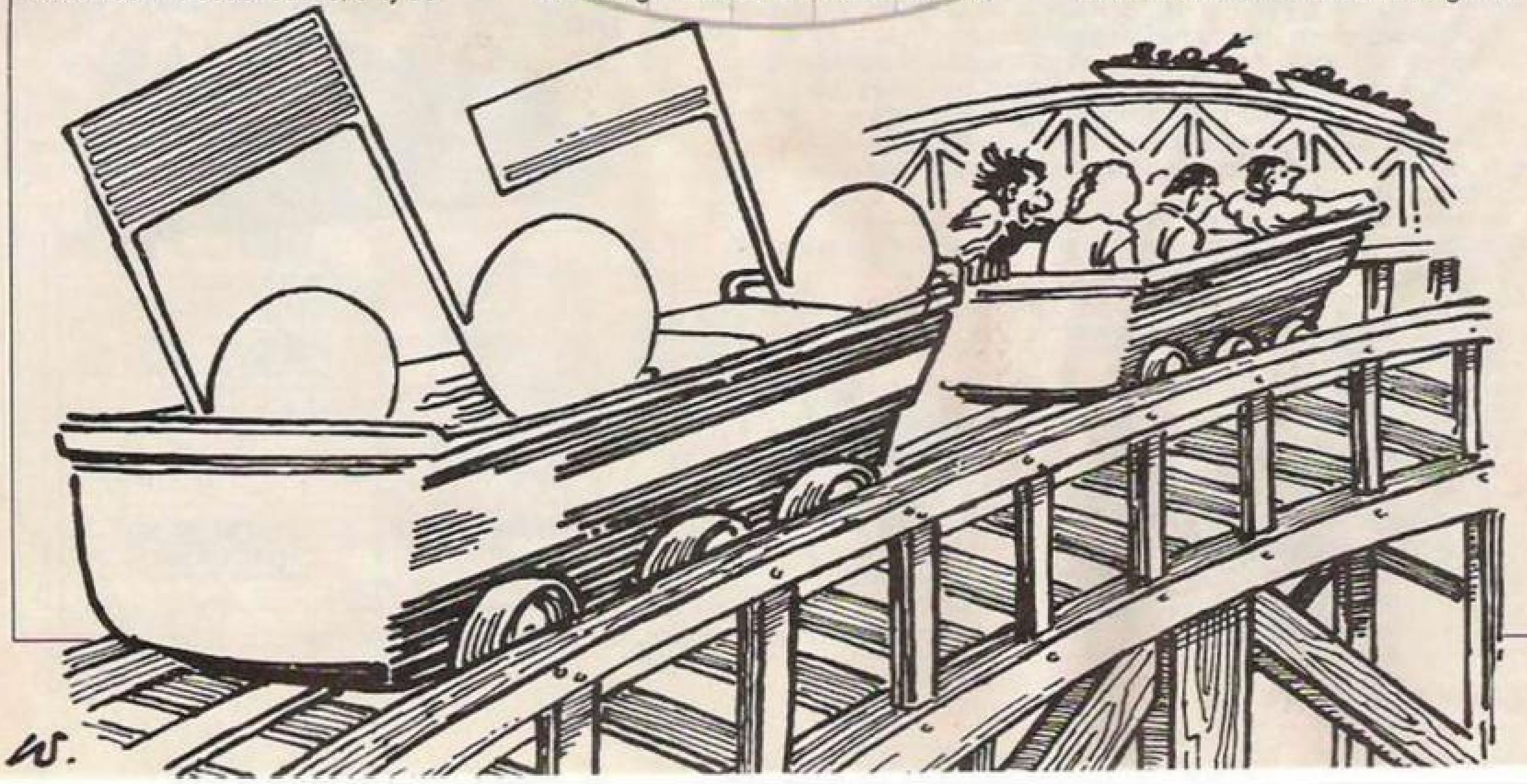
Lines 40 to 60 illustrate an easy way of generating a period table. This one puts the values 0 to 254 in successive bytes of a period table 255 bytes long. That should give a descending screech when run. It is a good imitation of the sound of a ricochet. It is how we obtained the ricochet sounds in the battle sequences of our wargame *Gallipoli*– CCS, 1986. As we shall see later, there are many other variations on lines 40 to 60, giving other types of sound.

Lines 80 and 90 tell Gliss the length of

CONSTANT PERIOD ➔ CONSTANT PITCH

Figure 1 (a)





the period table – count is the number of bytes in the table, 255 in this case. The address in memory at which the table starts is *Start*. Line 100 calls Gliss and the sound is produced. It makes the sound only once but you can add these lines to the program to make it repeat:

```
95  FOR J=1 to 20
and
105  NEXT J
```

It is a short step from the foregoing to a realistic police siren sound. Alter line 50 to:

```
50  POKE 65056+j,255—j
```

and add the looping lines 95 and 105 listed.

The more mathematically inclined will leap at the chance of devising other ways of setting-up the period table. The main point to remember is that the values poked into the table must be in the range 0 to 255. Negative values are not allowed.

This line makes use of one of the Spectrum Basic functions:

```
50  POKE 65056+j,5*LN(J+1)
```

The 'J+1' is necessary because the LN function does not accept zero as an argument. This sound gives a high-pitched tweet which, if repeated in a FOR...NEXT loop, sounds like chattering bird-song.

Having started on functions, what kind of effects can you obtain using SIN, COS, TAN, or EXP? The first two always give values between −1 and +1, so it is essential to get rid of the negative sign and also to use a multiplier to obtain values in the range of, say, 40 to 230. Try this one:

```
50  POKE 65056+j,INT(150+90*(SIN
    (j*.0246))
```

The call of the nocturnal Spectrum hacker to its mate? Now try playing with the values in the expression and see what effect that has. With such expressions, generating the period table may take an appreciable time. Note that once the period table has been generated and the pokes for the routine have been done, there is no need to re-run Roller every time. The sound can be repeated by typing GOTO 100.

The longer the period table, the longer the duration of the sound. The Basic program sets aside 1,000 bytes, of which we have used only 255 so far. It is a simple matter to amend the program so that we use all 1,000 bytes:

```
40  FOR J=0 TO 999
50  POKE 64312+j, INT(ABS:j—500)/2)
```

This pokes values starting from 250, falling to zero and then rising again to 249. Alter lines 80 and 90 to make *count* equal to 1,000, and *start* equal to 64312. Can you predict what the sound will be? Try it.

With 1,000 bytes to play with, there is room to build more complex sequences of sounds. Pitch can be made to rise sharply, then fall slowly, and finally rise to its highest at the end of the sound. You can do that by using different FOR...NEXT loops for each section of the sound. If 1,000 bytes is not sufficient, set RAMTOP lower, to clear more space in memory.

You can also use the 1,000 or more bytes to store the tables of several shorter sounds. In that way you can store

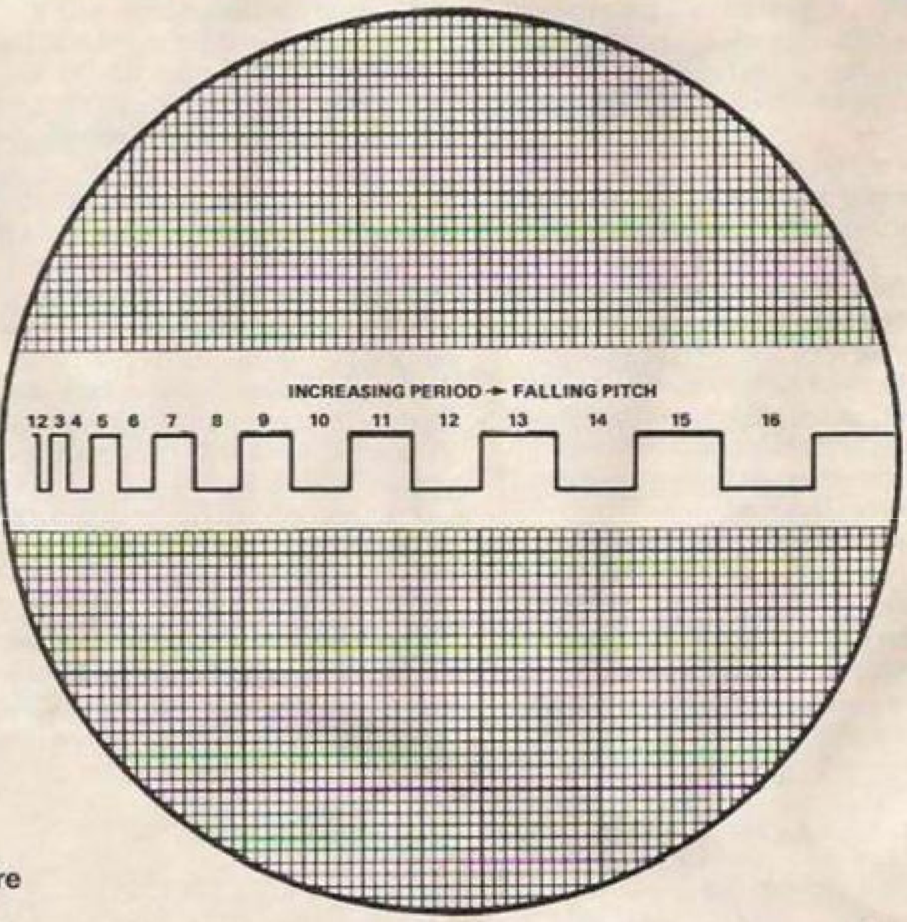


Figure 1 (b)

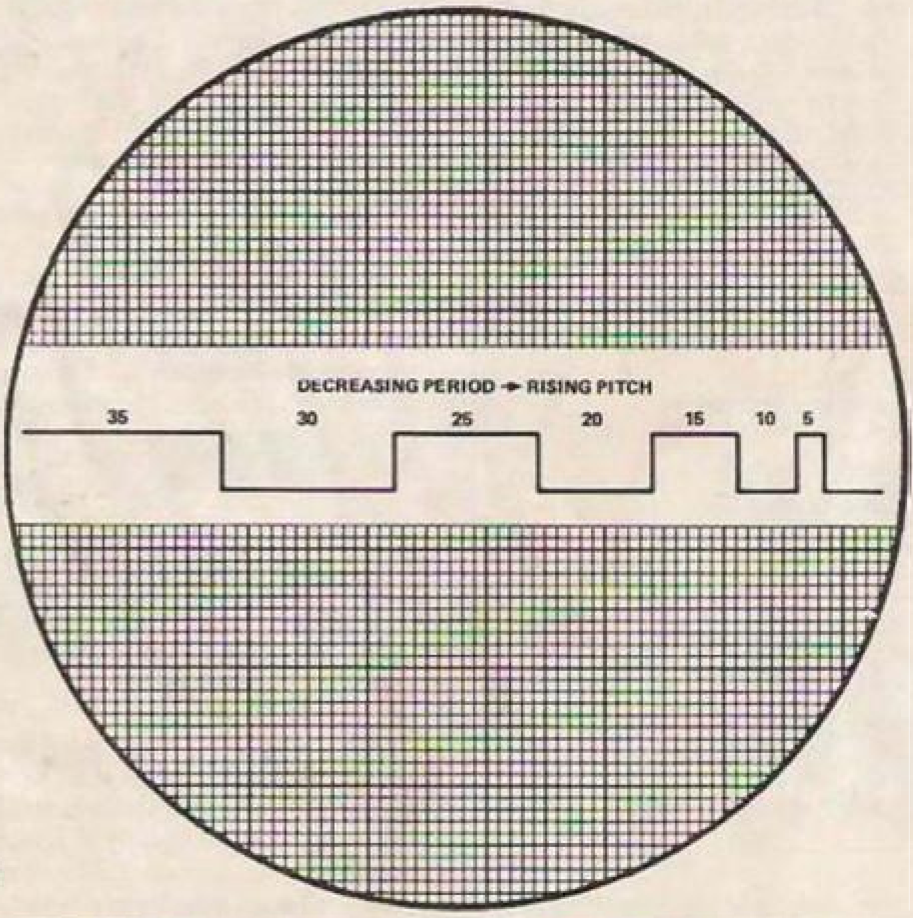


Figure 1 (c)

all the sounds needed by a given games program and produce any one of those as required by setting *count* and *start* to appropriate values before calling the routine.

With the 48K Spectrum there is a limit to how many sounds can conveniently be held in memory, especially if the game program is long. With the 128K Spectrum, that is no problem. Set aside, say, 1,000 bytes of main memory as a period table area and then use the overlay technique described last month. Period tables are stored in RAMdisc as binary files and called down into the period table of the main memory, using LOAD!, when required.

Most sounds do not consist of a single note but of several notes of different pitch sounds simultaneously. In musical terms, the fundamental is accompanied by a number of harmonics. It is the presence or absence of the harmonics and the relative strengths of those present which allows us to distinguish the sound of a violin from that of an oboe.

The effect of the combined sound of the fundamental and its harmonics is to produce a complex soundwave, as shown in figure two. Although the sound generated by this routine has an approximately square waveform, we can approximate to a complex sound by setting-up the period table with a repeated sequence of numbers. The following line generates the simple sequence, '125,150,125,150,125,150...':

```
50  POKE 65056+j,125+50*(j/2—INT
      (j/2))
```

When j is even, j/2 equals INT(j/2), so the expression has the value 125+50*0 = 125. When j is odd, it has the value 125+50*.5 = 150. The effect is a complex sound which is similar to a ringing bell. If you put this into a FOR...NEXT loop, the telephone begins to ring. Now program it to make the characteristic British Telecom ring-ring...ring-ring.

Another approach is to let the routine operate on a random set of numbers. The Basic interpreter program of the Spectrum ROM is, in effect, a random series – apologies to those who wrote it. So omit lines 40 to 60 and set the start to 0 or some other address in the ROM area, 0 to 16384. The sound is a hiss, usually referred to as white noise. Noise is already available on the 128, using the noise channels, but not on the 48K machines. Since white noises are the basis of all kinds of sounds from rifle fire to steam locomotives, this routine is particularly helpful to 48K programmers.

There is a difference between the white noise emitted by a steam valve and that caused by an exploding grenade. If you require different kinds of random noise for different sound effects, you will need to generate your own random table. The result depends on the range of numbers in the table. This line, used to generate a table of 1,000 bytes starting at 64312, produces random numbers between 50 and 150:

```
50  POKE 64312+j,50+INT(RND*101)
```

Compare the sound of that table with this one, in which the random numbers are between 200 and 250:

```
50  POKE 64312+j,200+INT(RND*51)
```

You may have noticed that we have not explained previously the action of line 70, though you probably will have noticed that the border of the screen changes colour when the program is run. It flashes yellow every time a sound effect is heard, reverting to red afterwards. This is the result of the POKEs in line 70.

The number POKEd to 65312 determines the colour of the border during the sound. The colour obtained is that marked on the Spectrum numeric keys 0 to 7. Similarly, the value POKEd to 65313 sets the colour to which the border returns after the sound is completed. Try the effect of altering the values POKEd by line 70.

The examples will start you exploring the wide range of sound effects which can be produced by this short and simple routine – roller-coasting can become addictive. Of course, the routine may be a short and simple one but it is the period table which provides the sound. Here is where your creativity can really have its fling.

There are innumerable variations on the kinds of table we have already described. Then, for the dedicated hacker, there is the task of generating a super-period table, say 30,000 bytes long.

That would give scope for an intricate series of sound effects lasting several seconds – perhaps that of a rocket ship beginning its flight into outer space, or perhaps that of a kindly Dalek voice wishing all readers a happy birthday.

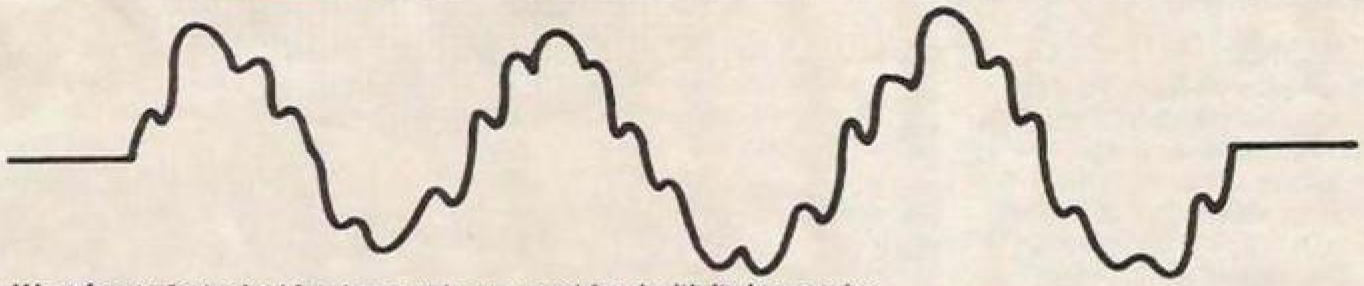


Figure 2. Waveform of a typical fundamental note combined with its harmonies.

```
   10 CLEAR 64311
   20 FOR j=65312 TO 65367
   30 READ x: POKE j,x: NEXT j
   40 FOR j=0 TO 254
   50 POKE 65056+j,j
   60 NEXT j
   70 POKE 65312,6: POKE 65313,2
   80 LET count=255: POKE 65315,I
NT (count/256): POKE 65314,count
-256*PEEK 65315
   90 LET start=65056: POKE 65317
,INT (start/256): POKE 65316,sta
rt-256*PEEK 65317
  100 RANDOMIZE USR 65318
  110 STOP


  200 DATA 0,0,0,0,0,0,237,75,34,
255,197,58,32,255,87,246,16,95,4
2,36,255,123
  210 DATA 211,254,78,13,32,253,1
22,211,254,78,13,32,253,35,193,1
1,197,121,254,0,32,233,120,254,0
,32,228,58,33,255,211,254,193,20
1
```

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Relaying Information

The Automobile Association is in the process of computerising its operations to increase efficiency and to cater for the increasing number of breakdowns with which it deals. Armed only with a membership card, John Barnes investigates.

The Automobile Association is an organisation familiar to most people. When driving round the country or in one's locality, the sight of a yellow van next to a broken-down car is not out of the ordinary. The side of the AA with which we are most familiar, however, is the breakdown van and the service man. That aspect of its activities is governed by a network of computers and radio systems to serve the motorist in need quickly and efficiently.

In 1985, the AA handled almost 3 million breakdown calls in the U.K., 628,374 of which were breakdowns in the Greater London area and 2.5 million general information enquiries calls. The AA predicts that by the year 2000 it will be handling around two million calls a year, which represents a phenomenal increase in a relatively short time.

To meet the growing demand expected of the service in the next 15 years, the AA is introducing new computer technology to help make the service more efficient and to provide the system with the capability to handle the expected increase in demand.

The heart of this new system is a purpose-built London operations centre at Stanmore, Middlesex which houses a large computer-controlled telephone system, an ICL mainframe computer network and the AA Roadwatch studios, all of which represent a £30 million investment. It is the first of a number of similar high-tech centres which will be opened round the country by the year 2000.

The Command and Control System is being introduced in two phases. Phase one, now operating in London, speeds telephone answering; phase two, expected to be fully-operational in early 1987, will revolutionise communications between radio operators and patrols on the road. In simple terms, Command and Control means a faster and more streamlined service for motorists.



All details of an AA member's breakdown will be printed out in a patrol's van, saving time and giving greater accuracy.

Trunk lines

Once a member's call is connected, it is passed to an operator by an automatic call distribution system. Supplied by Thorn Ericsson, the system is designed to reduce the time taken handling incoming calls, thus keeping lines free for other callers.

The system, known as ASDP 162 automatic call distribution system, will cope with requests for assistance and information, queueing calls as they are received. As a call reaches the head of the queue it is directed to the first available operator. Handling calls in that way means that trunk lines are maximised and there is a fair distribution of work among AA staff.

At an operation centre such as Stanmore, handling calls efficiently is vital. It will receive an expected 4,000 incoming calls per day, with 90 trunk lines being served by 81 operators, five monitors and a supervisor. Other features of the system, such as listening and intrusion facilities, permit staff dealing with difficult queries to be given advice directly by more experienced staff, thus reducing the waiting time of a caller and the on-line time of the operator.

While the caller is on-line the operator takes relevant details, such as location, type of breakdown, membership details and the home address of the caller, and the information is entered directly into the computer system, thus saving vast amounts of disordered paperwork. There is a direct link with the AA head office at Basingstoke, Hampshire and membership details are checked with member-

ship records to confirm that the caller is a bonafide member.

Once all those checks have been carried-out, the computer locates the position of the vehicle. That is performed on a new computerised gazetteer, which is incorporated into the Command and Control System and is based on the AA Greater London Street Atlas. The system identifies whether the caller is in a public telephone box and identifies the location by using coded numbers.

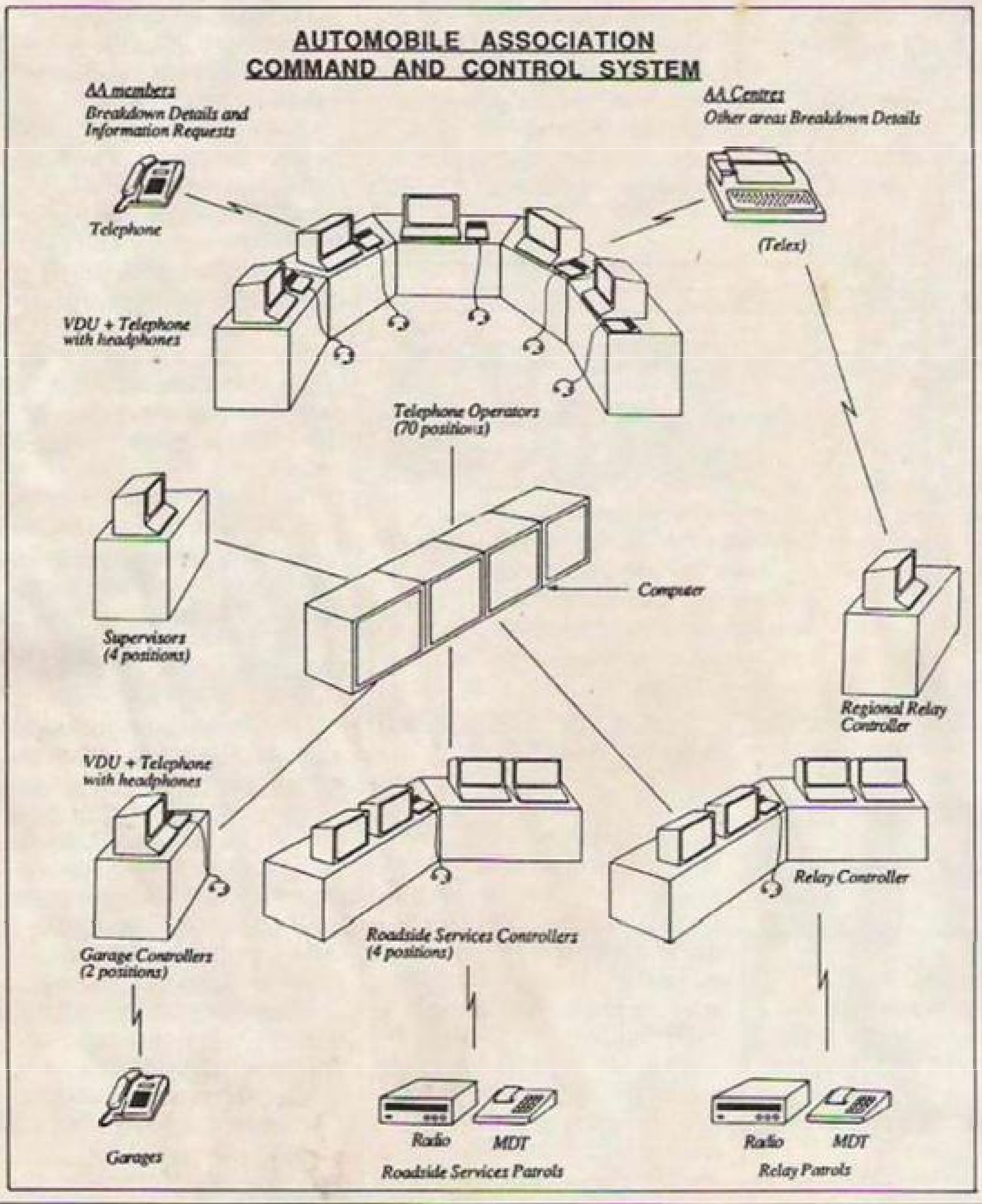
Soundex facility

The gazetteer holds the entire road network of Greater London, which incorporates local names, public houses and buildings. That is because the system also has a Soundex facility which can be used if the information given by a caller does not coincide with street names. If, for example, a caller was outside a building in London and knew only the name of that building and not the street, the computer would give the operator an accurate map reference.

The next stage of the process involves communication between the operations centre and the patrols on the road. In London there are approximately 600 patrols, each equipped with a two-way radio



and a mobile data terminal in constant contact with the operations centre at Stanmore. The information collected by the telephone operator is passed to the roadside services controllers, who locate



which patrols are in the area and assign one of the patrols to deal with the breakdown.

Coded messages

Information relating to the job is then sent to the patrol car via the radio link and is printed-out so that all the necessary data is received accurately. The data terminal is a very simple piece of equipment. Consisting of a 16-button keyboard and a small thermal printer, it communicates with the main computer via the radio link all patrols have. It offers a number of benefits to the patrol vans. They no longer need to wait for often busy air space to communicate with control, as the keyboard allows coded messages to be sent back to base if it is difficult or too busy to use the microphone.

There is also no mishearing of details, which results in considerable time-saving, and the printout means that even if patrols are working away from their vehicles, details of the next job are taken and waiting ready to be actioned, providing better service and information for the patrols.

The Command and Control System does not just help those who have broken down; it also aids the AA in collecting and passing on motoring-related information. At Stanmore there is a huge database of general motoring facts, current road works, traffic, events and details of weather conditions and how they relate to the roads. Many of the calls received are not breakdown-related but are by members requiring traffic reports before they embark on a long journey or who just require motoring advice. With the help of Command and Control, information is given quickly and efficiently by the operators working on the service.

Biggest centre

Also at Stanmore is the AA Roadwatch unit, the biggest traffic broadcasting and information centre in Britain. Roadwatch operates 24 hours a day and supplies live traffic bulletins to 10 local radio stations in the south-east. In addition, the service also gives regional and national road, weather and traffic information to television, the press and national radio stations, as well as a daily service to British Forces Broadcasting and the road news pages of Oracle.

When the project is completed in early 1987, it will be one of the most efficient and up-to-date systems in Europe, produced largely with the help of British talent. So next time it seems you are due for a long wait when you are sitting in your car at the side of the road, remember that your wait is probably due to the number of breakdowns rather than any suggestion of inefficiency.

WORDS FOR THE WISE

A variety of low-cost PC-compatible word processors are now available. Michael Graham assesses the performance of four leading packages.

As a rule of thumb, the price people are prepared to pay for any applications package is about 25 percent of the purchase price of the hardware which makes up a system. That means that with computers in the Amstrad PC1512 price range, between £100 and £250 would be a reasonable price for users to pay for software, the higher end of the range corresponding to users of the 1,000 hard disc-based Amstrad machine.

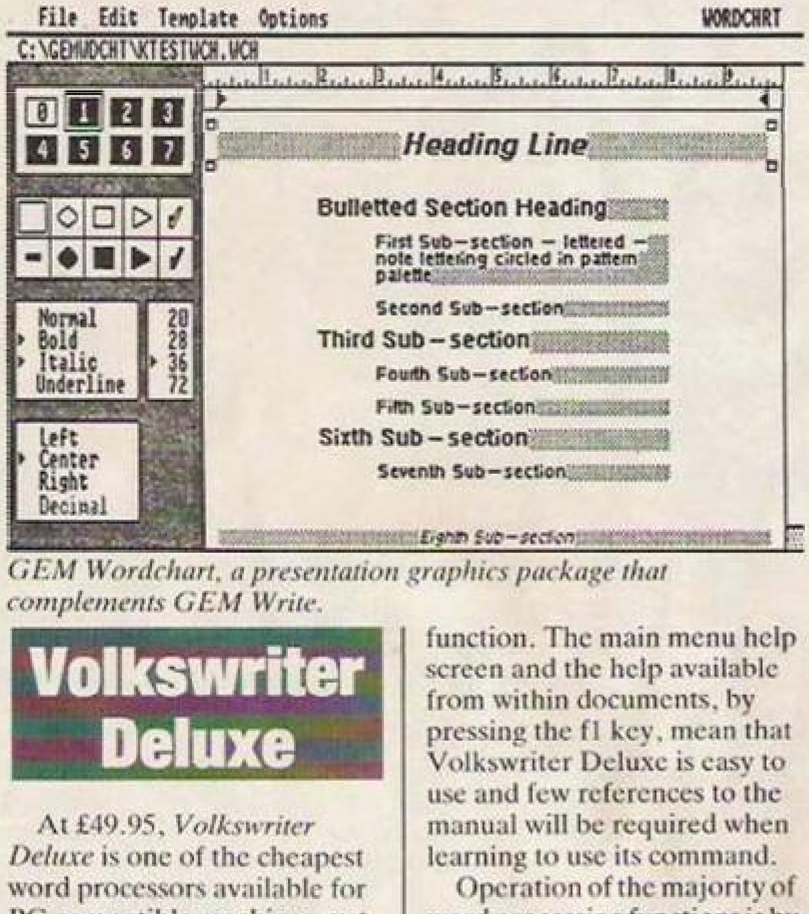
Nearly all users of a personal computer will require a word processor for use with their hardware and the appearance of the low-cost PCs has meant that there is now a wide choice of high-specification word processors conforming to the 25 percent rule.

In general, low-cost PC software can be broken into two groups. There are long-established products, for which the authors have long since recouped the development costs and can thus offer packages which previously cost many hundreds of pounds at a fraction of the original price charged for them. The second group of products consists of software written specifically for the low-cost end of the market.

A further subdivision of this class of products reveals those which are modified versions, sometimes cut-down versions, of higher-priced products offered by the same company and other packages which are one-off implementations of a low-cost word processor produced by companies specialising in low-end PC software. Such products are often versions of packages which originated in the States, being written for the PCjr.

The old adage that you get what you pay for is a less reliable guide to the quality of low-cost PC software than it is in other areas of computing. It is certainly true that some of the lowest-cost packages offer a level of performance considerably better than other products costing significantly more.

All the word processors in this price range offer the basic functions of text storage and manipulation, although some are more sophisticated in the features they support. Some of the products offer additional facilities such as a mail merge option for the production of mailshot letters or a spell check and word count program which can be used to check the accuracy of a document.



GEM Wordchart, a presentation graphics package that complements GEM Write.

Volkswriter Deluxe

At £49.95, *Volkswriter Deluxe* is one of the cheapest word processors available for PC-compatible machines, yet it offers a very high level of performance. The program, as with all the products mentioned in this review, may be used with either a floppy or hard disc-based machine. Using a hard disc has the usual advantages of increasing the speed of operation of the program and avoiding the disc swapping inevitably required when using only floppy disc drives. Hard disc users will benefit from the simple method that Volkswriter Deluxe handles file storage, allowing users to specify drive and path names of a document in a straightforward fashion.

The program is menu-driven, with the opening menu presenting a range of system-level functions, including the creation and modification of documents, printing of files and access to the help function. The main menu help screen and the help available from within documents, by pressing the f1 key, mean that Volkswriter Deluxe is easy to use and few references to the manual will be required when learning to use its command.

Operation of the majority of word processing functions is by way of the PC function keypad in conjunction with the shift, control and alt keys. The specific key combinations required are shown as part of the on-screen help display.

One of the many powerful facilities supported by Volkswriter Deluxe is the ability to handle foreign language character sets. That ability is useful not only to the polyglots among WP users but to those with a requirement to produce engineering or scientific texts which often make use of the Greek character set within formulae. The program is configured for use with foreign language characters by using the KEYBD.INT file supplied as an MS-DOS utility.

Other sophisticated features include the support of multiple fonts, assuming a printer capable of supporting them, true proportional spacing and a basic mail merge facility for the preparation of personalised mailshots. Another useful feature of the word processor is that it supports a number of printer drivers which should cover the vast majority of installations.

The most obvious omission from the facilities provided by Volkswriter Deluxe is a spell check program. It can be argued that many users will, for the majority of the time, be using their systems to produce short letters and documents and that for such applications a spell check is not an important option.

Some users of word processors, though, rely on a spell check routine to check their work and for those users the lack of a spelling checker will mean that Volkswriter Deluxe will not be for them.

At a retail price below £50, albeit by only one penny, Volkswriter Deluxe offers a very high level of performance. Text entry and manipulation is straightforward and the package builds-in a text merge

function. The only notable omission from the range of facilities is a spell check but for £50 you cannot have everything.

Volkswriter 3

Volkswriter 3 is the bigger brother of the Deluxe package offering a level of performance to compete with the most sophisticated of PC word processors, yet at a price which manages to break the £200 barrier if VAT is excluded. At that price, the product will appeal both to home and small business users who make significant demands of their word processing systems.

In operation, the program owes much to Volkswriter Deluxe, although it would be incorrect to think of Deluxe as a cut-down version of Volkswriter 3. The major additions to the facilities offered by Volkswriter 3 over those of the Deluxe package are an impressive spell check program, complete with a 170,000-word dictionary, one of the largest available to PC users. Another useful function provided by Volkswriter 3 is the ability to perform basic sort and arithmetic functions on text and figures created as part of a document.

GEM Write

Owners of the Amstrad PC1512 hardware will be familiar with the GEM user interface which is part of the software bundled with the computer. Also bundled with the PC1512 is one of the Digital Research products designed to operate in the environment provided by GEM, namely *GEM Paint*.

With word processing the number one application of many PC users, it may be a surprise that while Digital Research produces a word processor which operates in a GEM environment, Amstrad chose not to bundle that product in preference to the Paint graphics package. *GEM Write*, though, is available as a word processing option for Amstrad and other PC machines running GEM.

As with other applications in the GEM range, GEM Write is a presentation-orientated package which can incorporate graphics output from other GEM applications, including GEM Paint, within documents to add greatly to their impact.

As a straightforward word processor, GEM Write is somewhat limited in capability. While the basic functions of text input and manipulation are supported adequately, other refinements such as a mail merge feature or spell check option are missing from the package.

GEM Write would be of most use to those wishing to produce short documents, the presentation of which is of great importance. For many users the lack of facilities provided by Write will mean that they will find one of the other low-cost PC word processing packages more suited to their needs.

WordStar 1512

When Amstrad was looking for a word processor which could be marketed alongside its PC1512 range of computers it selected MicroPro to undertake the development of a suitable product. MicroPro was responsible for perhaps the most famous word processing system of all, *WordStar*. In its original form it was a word processing system developed for 8-bit computers running under CP/M 80, although the company has since developed a range of PC-compatible products.

WordStar 1512, although marketed at a price significantly less than other products in the MicroPro range, is scarcely a cut-down product. The user interface and central code of the program is a version of that developed for *Easy*, a full-price word processor no longer marketed in the U.K.

While 1512 is marketed by Amstrad, the package can be used on any IBM PC-compatible machine, although the instructions in the manual refer specifically to installation on the Amstrad range of hardware.

The brief given by Amstrad to MicroPro included the requirement that 1512 should be an easy-to-use product in keeping with the switch-on-and-go policy Amstrad adopts for all its products, both hardware and software. To meet the requirement, 1512 is controlled via a series of menu screens. The opening menu allows users to select from the main functional blocks of the program; creating and editing a document, printing output and entering the mail merge function are all included in this menu. A particular option may either be selected by moving a highlighted bar over its entry with the cursor key or by typing the initial letter of the command.

Having entered a document, the user has only to master two function keys to make effective use of the word processor – the f1 key to bring down an in-context help screen if that is required and the f2 key, which brings down one of two menu displays which give access to the various text manipulation and modification commands.

They include such options as bold and underline print and centring of text on a line. The spell check option is also available from one of the two f2 drop-down menus.

The on-screen display produced by WordStar 1512 is not WYSIWYG – What You See Is What You Get – although a prompt line at the top of the display indicates the text font in effect at the cursor position.

In operation the spell check will highlight any words not included in its dictionary and offers the user a number of choices of action to take. One of them is to suggest words which may correspond to the correct spelling of an unrecognised word.

The suggestions are offered one at a time; the user may either accept an offered suggestion or move on the next most likely word. Alternatively, the word may be added to the user's dictionary or the correct spelling may be entered via the keyboard.

WordStar 1512 is a very easy-to-use and powerful package which is an ideal complement to the Amstrad PC1512 and any of the other low-cost PC clones available. One of the few disadvantages of the product for users of a floppy-based system is that, in use, an irritating number of disc swaps are required as the various functions of the system are called.

Thus during printing the WP disc must be removed and the printer driver disc inserted in its place.

Hard disc users will not suffer from those irritations. The level of performance and low price of 1512, combined with the marketing effort of Amstrad, should make it the standard by which other low-cost WPs will be judged.

AT A GLANCE

Volkswriter Deluxe – Price £39 plus VAT

Volkswriter 3 – Price £199 plus VAT

Lifetree Software, Lowndes House, The Bury, Church Street, Chesham, Bucks HP5 1HH.

WordStar 1512 – Price £69.95 VAT inclusive

MicroPro International Ltd, Haygarth House, 28-31 Wimbledon Village, London SW19 5BY.

GEM Write – Price £99.95

Digital Research, Oxford House, Oxford Street, Newbury, Berkshire RG13 1JB.


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Cheetah's neat splitter unit complete with self-adhesive pad allows you to keep your T.V. and computer aerial leads plugged in without disturbing the picture.
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Spectrum 128/+2 to Midi Lead
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Delta – the next step forward

The follow-up to the smash hit* Sanxion *is near to completion, so in this exclusive preview,* Your Computer *looks at Delta, to see if it can match the success of its illustrious predecessor.



Stavros Fasoulas was, until a few months ago, an unknown programmer who sat at home in Finland fiddling with his Commodore 64 and wishing for great things. One day he visited the Commodore show, met Andrew Wright, and signed a contract to write *Sanxion* and *Delta* for Thalamus.

When Sanxion was released, it was almost universally agreed that it was one of the top shoot-'em-ups of 1986. It has excellent graphics, a superb Rob Hubbard soundtrack, and played well. When, therefore, only a few months later, Delta was near to completion, it seemed that the game must have been rushed, since



there was so much to be completed so fast. How wrong could we be? If you liked Sanxion, you will love Delta, and even so soon it looks to be the shoot-'em-up to set the standards for the rest in 1987.

On loading, you are greeted with the now familiar style of Fasoulas' graphics, albeit that they are not finalised yet. Then the game begins in earnest. The game is a left-to-right scrolling shoot-'em-up but, unlike Sanxion, to complete the game you must be dextrous and clever, too.

To complete the first level, you must first shoot every one of the first alien attack wave. Once that is done, you are allocated one token. For each token you manage to accumulate, you can obtain one different addition to your ship. In effect this means that, as you progress through the game, your ship transforms from a standard single-firing spaceship to a multi-fire, super-fast, undetectable supercraft.



In total, Delta will have more than 50 levels and more than 200 alien attack waves. As you can see from the screenshots, the graphics are excellent and, in particular, the Sea of Dreams, which features walls of water at the top and bottom of the screen. As the water splashes, you must avoid it at all costs.

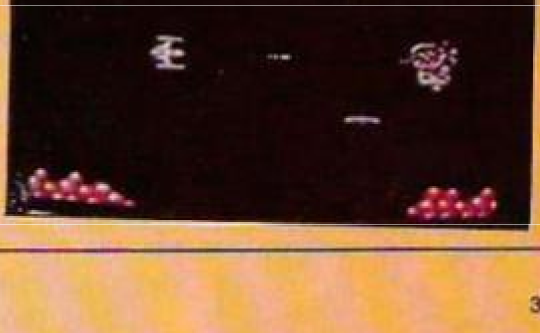
If you manage to collect eight tokens, you can take the ultimate weapon which allows you to fly through the aliens, with no sprite collision detection. Beware, however, if you try to obtain an addition of a higher value than the amount of tokens you have collected, you will die a horrible death.

As with Sanxion, the game features tremendous attention to detail and the aliens, in



particular, are all different, varying from spinning hoops to circling blobs – for want of a better description.

If you liked Sanxion, Delta will be up your street. The music is being written by Rob Hubbard and promises to be even better than his version of *Romeo and Juliet*. If Delta is not one of the best games of 1987, it will have to be a very very good year.



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The Official Guide to Pascal on the Commodore 64
Author: Ian Sinclair
Publisher: Cassell Computing
Price: £9.95

There has been a need for a good book on Pascal for the home micro user for some time. As most compiler writers would testify, languages demand more in the way of technical support and documentation than any other feature of computing. There is, as yet, no better way to learn a language properly than a well-written book explaining clearly and concisely everything which needs to be known.

While Pascal has been used as a teaching language for a considerable time, it has never replaced Basic as the language for microcomputers. With the help of the book it is possible to explore this powerful language to permit you to make the most of your Commodore 64.

Set out clearly, the book provides simple explanations, clear program listings, a number of practical examples and useful advice on debugging techniques.

Beginning with the basics, the book moves to more complicated aspects of the language and has chapters dealing more fully with built-up areas, menus and files, advanced records, graphics and sound, string procedures and functions.

The abundance of listings gives the reader practical tuition and the author has been careful to keep the content very much related to the C64, by not covering aspects of Pascal of little use to Commodore owners.



16 Bit Microprocessor Handbook
Author: Trevor Raven
Publisher: Newnes Technical Books
Price: £9.95

This book examines the characteristics of the four most popular chips on the market, the Intel 8086, the Motorola 68000, the Zilog 8000 and the TI99000. Machines based on the 16-bit microprocessor have become the standard. Of the processors used, the four covered in the book are by far the most dominant, with more than 95 percent of the microcomputers on the market containing one or other of them.

For the designer, the book presents a complete description of the chips and a comparison with the others available, which should prove useful for anyone wishing to investigate their qualities.

Despite its very specialised nature, the book is very well-written and therefore easy to read. It also has a number of useful appendices providing information on the names and manufacturers of 16-bit machines. U.K. suppliers of 16-bit processors, a quick reference chart comparing the features, an ASCII character code and code chart, as well as the usual glossary of computer terms.

The author is a chartered electronics engineer, with 25 years' experience of the industry and 14 chip designs to his credit.

Practical Interfacing with the BBC Micro
Author: Geoff Bains
Publisher: Chapman and Hall/Methuen
Price: £7.80

Despite its fearsome title, this book is intended for the beginner and aims to give practical hints and tips which will help to get the most from the BBC micro. The structure of the book is project-based, starting with control circuits and moving to more complicated devices, such as robots, in the later chapters.

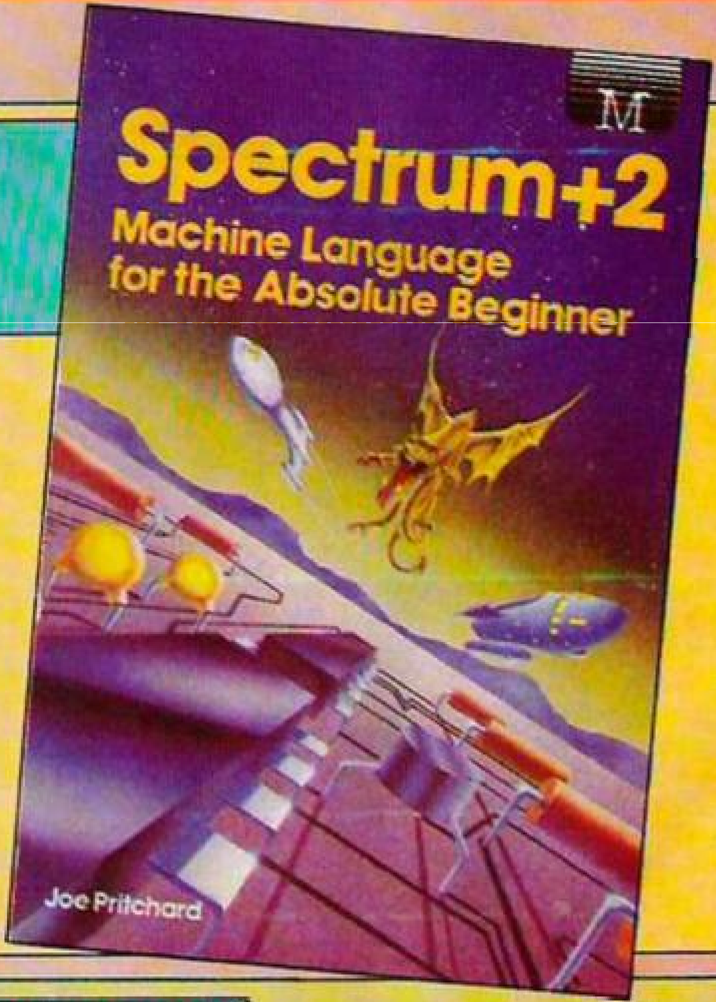
As the introduction states, it is important to learn two new skills to embark on the projects but they are not beyond the capabilities of any competent person. The skills are more concerned with having the confidence to start on an electronic and software project than any practical ability, which will be acquired when working from the book.

The first chapter deals comprehensively with the versatile interface adaptor or VIA and explains the basic principles and reasons behind interfacing the computer. Despite the seeming complexity of the projects, everything is explained in great detail, including the basics such as how to solder.

With the knowledge which can be gained it is possible to construct a number of devices – from digital clocks to robots. The book is good value and should provide anyone interested in the BBC computer with a great deal of entertainment.



Spectrum +2 machine language for the absolute beginner
Author: Joe Pritchard
Publisher: Melbourne House
Price: £8.95



The Spectrum +2 with its 128K memory is for many Sinclair owners a long-awaited arrival. The enhanced sound, built-in data recorder and joystick port give the machine a new lease of life and offers greater potential.

This book is intended for those familiar with Spectrum Basic and aims to instruct the reader in the programming capability of machine code, thus allowing the potential of the machine to be utilised more fully.

With chapters on registers, addressing modes, 8-bit and 16-bit operation, jumps, loops and interrupts, keyboard reading, screen-handling and graphics, every aspect of programming in machine code is covered in detail. When the course has been followed through there are some ROM routines which are extremely useful and also a quick reference guide for instruction and op-codes, as well as a flag operation summary.

For anybody interested in the Spectrum, the book will prove a useful addition to any programmer's library.

How to write ZX Spectrum games and programs
Author: W. Simister
Publisher: Bernard Babini
Price: £2.50

This useful book is another in the now large Babini family, written as a step-by-step guide to help with the writing of graphics games programs on the Sinclair ZX Spectrum and Spectrum Plus.

The book starts at the logical beginning, with a chapter on the making and placing of graphics characters. While it is aimed at the beginner, a degree of familiarity with the machine is assumed and it is expected that users of the book will at least have read the Spectrum introductory manual.

Making use of short listings which the reader is able to type-in, it is possible to work your way through the book and gain a better understanding of Basic in a relatively short time. As the book progresses, the programs become more complex and such topics as how to throw dice, programming a chess game and writing a game in 3D are covered.

The book recommends that it is used at the same time as the computer and that all the information entered is saved to cassette tape, thus helping to absorb everything more easily.

For the money you cannot go wrong with this book. It covers everything that the games-writing beginner would need to know and the use of listings gives the reader something concrete to produce very quickly.

Using and Programming the Psion Organiser II
Author: Mike Shaw
Publisher: Kuma Computers
Price: £10

Having used the Organiser II since its launch earlier this year I have been acutely aware of the fact that I have uncovered only a small part of its potential writes *Ken McMahon.* A 'how to make the most of your Organiser' type book has been long awaited and when it finally arrived, in the form of *Using and Programming the Psion Organiser II* it was seized on with delight.

On devouring the first few chapters the delight turned swiftly to disappointment. I can accept regurgitation of a manufacturer's manual if the purpose is clarification of the usual badly-thought-out and hastily-written 'instructions' but the Psion manuals are well-written and perfectly adequate. The first 60 pages of the book, which cover how the organiser works, filing, diary, calculator and so on, are not therefore particularly useful.

From page 60 onwards it picks up. The bulk of the book is devoted to explaining OPL – the programming language of the Organiser II. Example procedures are given throughout the book; one makes the Organiser II ask for a password on switch-on, there is also a simple game. Most of the programming examples, however, are illustrated by a procedure to calculate decorating costs. Something of more practical use would have been a better choice.

Other than a few useful tips and two handy procedures I felt the book had little to offer. It has the style of a beginners' book on programming, rather than a practical applications guide. I do not think that is what the average 'Organised' person really wants. At £10 it is also hugely overpriced.



The Apple IIGS

Look out Amiga, look out Atari ST, Apple is back in the entertainment and hobbyist computer business and could mean trouble for the two 68000-based sound and graphics dream machines from those former home computer kings. Geof Wheelwright reports.



A palette of 4,096 colours.

The new Apple sound and graphics dream machine is, in fact, not even based round the 68000 processor which has stood the company in such good stead on its now-businesslike Macintosh and Mac Plus. The Apple IIGS, which Apple says stands for Apple II with enhanced Graphics and Sound – although old Apple fans suggest the new micro is the Apple II Granny Smith, an American apple of the edible variety – uses the Western Digital 65186 processor, an upgraded 16-bit version of the 6502 processor made popular in the Apple II.

As you have probably guessed, the Apple IIGS is largely hardware- and software-compatible with the old Apple IIe and Apple IIc – now discontinued in the U.K. – but like most updates of classics, the machine also includes many of its own exceptional features which could make the IIGS a classic by itself.

Before I go further, you deserve a few basics about the machine. It has 256K RAM, an external 720K 3.5in. disc drive, mouse, monochrome monitor interfacing for serial printers and a modem, joystick, RGB monitor, and connection to the Apple Appletalk networking system.

The final surprise

On the software side, the machine is made even more notable by including a specially-re-written version of *Mousedesk* which allows you to use the machine in almost exactly the same way as the Apple Mac – except in colour – with better sound.

Just to make ST/Amiga buyers grind their teeth a little harder, the Apple IIGS has a built-in Ensoniq synthesiser chip with 32 oscillators and 64K of dedicated RAM separate from the main machine memory.

The final surprise on this increasingly pleasant dream machine is the price – £975, to be exact – for the basic machine with monitor, software and mouse.

That scarcely puts the machine in the bargain basement but certainly puts it within the reach of those who would consider saving similar amounts for an Amiga, hard-disc Amstrad PC or Atari *1040STF*. I must say that the Apple IIGS compares very favourably against those machines. It is fast, offers excellent colour graphics – a palette of 4,096 colours – and produced the best sound I have heard from a sub-£1,000 micro.

Like all new machines, however, it will be tarred with the brush of having little software available for it. That is fair comment so far as it goes for new applications which take full advantage of the full range of colour and colour options on the IIGS, the Macintosh-style mouse-controlled desk-top or the speed and memory capacity of the processor.


Apple II, with advanced graphics and sound.

Those who would ignore the machine on the basis of having little software must look at how long it needed for 'proper' software to be developed for both Macintoshes and even the IBM PC. It was not until the Big Blue machine had been out for about two years that specially-written applications began appearing in volume for it.

The Apple IIGS has the advantage of already being able to use existing Apple peripherals and most of the existing Apple II software, some of which is still excellent. The latest version of the *Appleworks* integrated software package, for example,

includes word processor, database and spreadsheet and has been updated to allow for addressing fully the machine's megabytes of potential RAM and higher processor speed.

A telling point was made at the recent AppleWorld Show in London, where the IIGS was displayed along with a number of the software houses which were developing mouse-based software for it. It is not surprising that there were recent conversions of entertainment software applications which had started life on the ST and the Amiga but were now running satisfactorily – and some of them even better – on the GS.

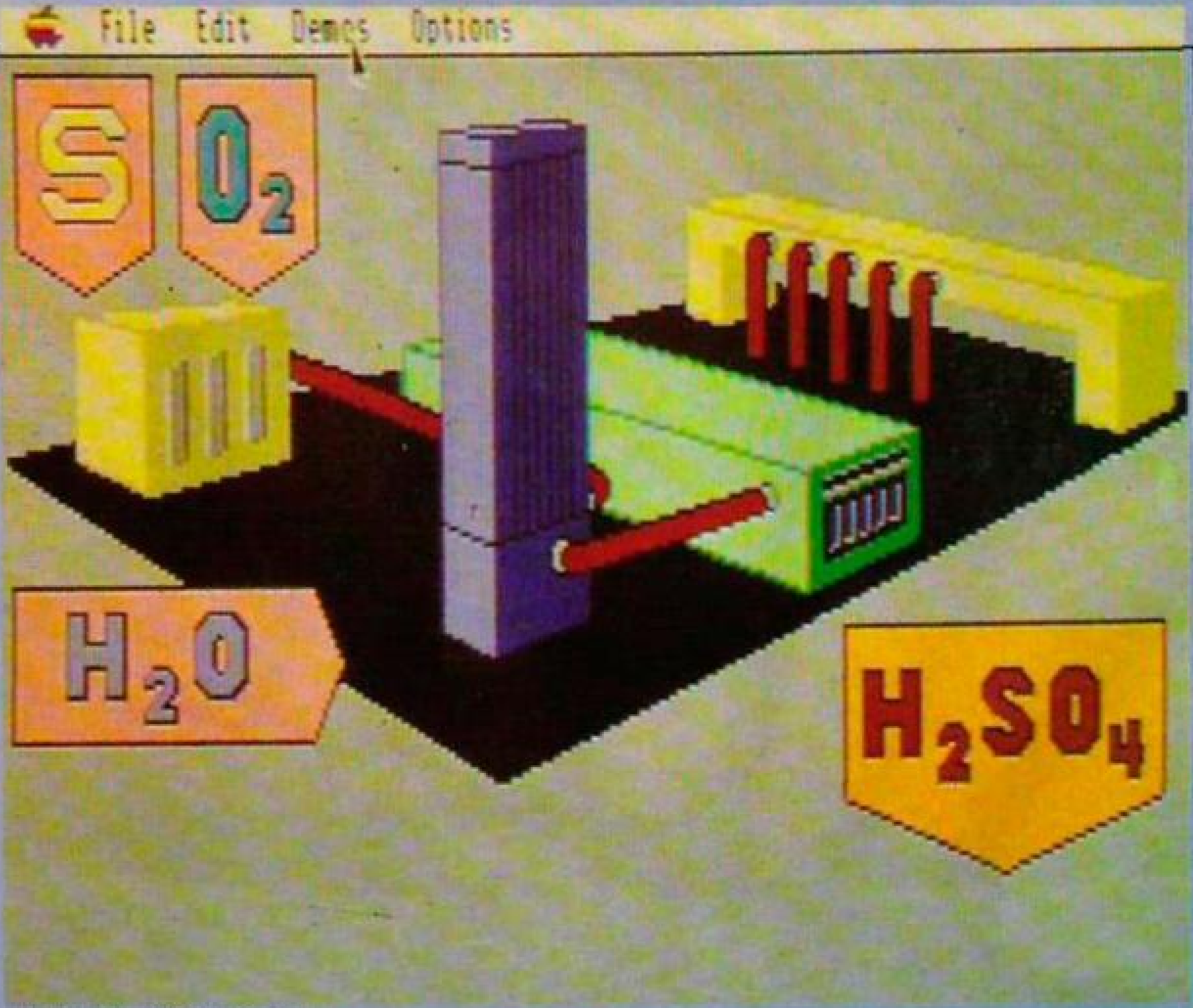
Mac Quickdraw

The availability of this Mac-style interface on yet another Apple machine is likely to tempt many buyers to think of the IIGS as a mini-Mac, when it is anything but that. While Apple has craftily adapted the Desk-top interface for use with the IIGS and even included many of the Mac Quickdraw ROM commands in the IIGS ROM, this is first and foremost an Apple II.

Other than the obvious capacity and processor speed differences, however, the major difference between this machine and the old Apple IIe and IIc is a specialised custom chip which Apple calls the Mega II. This custom IC includes most of the functionality of the entire Apple IIe circuit board on a single chip, thus speeding the machine further and reducing manufacturing costs even more.

For old-time Apple II fans, of course, the reduction of all they regard as technologically holy into a single chip is like sacrilege. So far as full Apple II compatibility goes, they would probably be correct.

When I tried running some old Apple II games on the IIc, for example, not all of them would boot, because many pioneering Apple II games writers had to write 'dirty' code which used 'illegal' memory address areas to speed operations, or simply to accomplish things which were not otherwise possible.



Applecolor RGB monitor.

The vast majority of software written for the II in the last two or three years should run with the GS and the thousands of applications such a list would include is certainly sufficient until the first flood of GS-specific software arrives – and arrive it should.

Unlike the Amiga and the ST, which both made rocky starts in the U.S., the GS has been well-received there and should quickly tap into the long-established Apple II home and education market, quickly bringing many new GS state-of-the-art games to the fore. How many of those we see the the U.K. will, of course, depend on how well the GS sells here but you can be sure to hear about that software soon.

If you do not want to run Apple IIe or new GS software on the Apple machine, old CP/M cards should give access to the likes of *Wordstar* and *dBase II*, while a new breed of co-processor card for the GS should widen that vista even further.

A number of third-party U.S. expansion card manufacturers have announced IBM compatibility cards for the GS, which should allow the machine to run software written for the IBM PC, or even the Amstrad PC, by putting some extra memory, an 8088 or 8086 co-processor and a PC-compatible BIOS on a plug-in expansion card. As the GS is an open-plan machine, the addition of IBM compatibility is thus a good deal easier than on machines such as the ST or the Amiga, where add-on boxes have to be put on the side of the machine as an afterthought.

At this point in my reveries, I should declare a bias in favour of the GS, since the first computer I owned was an Apple II Plus – an expanded one, with a full 48K of RAM and a single disc drive. As many two-computer families will know, sentimental attachments to one's first computer are very strong and I find it difficult to distance myself from my early traumas with the II Plus when I see the sleek, new IIGS.

For the sake of integrity, I should suggest that the IIGS is probably still a dream machine for most people because Apple has priced it too high for the U.K. market. After all, for a few hundred pounds less you can buy an Atari ST and for a few hundred more you could have a Macintosh. So why buy an Apple IIGS?

Unfortunately, if you have to ask that question you will never understand the answer. There are some people who still believe in the old Apple II design and what it had to offer – look at the way in which IBM copied the Apple II open-slot design – and they are not likely to be swayed by any amount of cheap Atari Mac imitators or IBM carbon-copy Amstrads. They want the best Apple II there is.

It is to those hardened Apple fans that I dedicate this particular dream, the dream of a machine which started the U.S. home computer revolution in 1977 and is still around 10 years later to talk – through a 32 oscillator sound chip, no less – about it.

INFORMATION
Apple Computer (U.K.) Ltd,
Eastman Way,
Hemel Hempstead,
Herts HP2 7HQ.
Tel: (0442) 60244 (24 lines)

Micros under the hammer



Do you need a new micro but do not really want to pay high street prices? If so, a visit to your local saleroom might prove profitable. Mike Hussey reports.

How about an Atari Touch Tablet with software for £15? Or a Cumana disc drive for the BBC micro for £34? Not bad for new equipment – and just two examples of auction room savings.

The current recession has caused many businesses to contract and others to fold. It is a sad law of economic life that what is a personal tragedy for the small businessman can lead to astonishing bargains for the customer. At a recent sale of bankrupt stock in Birmingham, an Epson printer with a price of £325 on the box sold for £130. A Cumana dual disc drive (BBC) realised £75 and a Protek 1200 modem plus interface (Commodore 64) was knocked down for £31.

Not everything the auctioneer offers for sale will be a bargain, of course – let the buyer beware is still the ruling sentiment in the saleroom – but provided you use commonsense and a few simple rules, you can enjoy the excitement of bidding but probably make a fair profit as well.

The first and most important rule is never to pay good money for anything you have not examined thoroughly. If the equipment is new and still boxed, make sure all the pieces, manuals and leads are present. Most important, check that the manufacturer's guarantee card is included.

In the case of used equipment, be sure to go on the viewing day and see if it works. Do not be satisfied with assurances from the local porters – it is not their money you are spending. Insist on seeing your potential purchase put through its paces. If possible, try to have another quick peep just before the sale. It is an unfortunate fact that some dealers who frequent auction rooms are at best heavy-handed and, at worst, downright destructive. Disc drive doors can be jammed, colour controls broken, and pin sockets distorted beyond recognition.

Before going to the sale, always fix your upper price limit, and never on any account exceed it. It is a good idea to fix an irregular sum, say £61, as many bidders will cease at £60. Also, be sure to allow for the extra 15 percent VAT.

Fierce competition

When should you enter the bidding? That is a difficult decision, as most auctioneers tend to start on the high side. If there is no support for a particular lot, it is a good idea to let the bidding proceed for a time. The Cumana dual disc drive mentioned had an asking price of £100, then fell to £50 before the first bid was received. The final selling price of £75

plus VAT compares to a list price of about £200.

If you are interested in business computers, competition from dealers can be fierce. Prices may go up to 75 percent and more of the retail value.

For home micros, on the other hand, it is very much a matter of who has bothered to go to the sale. If no-one else is interested in the configuration you favour it would not be unreasonable to expect to get what you want for less than 30 percent of list price.



Two days allowed

Now to the matter of payment. Typical conditions of sale require an immediate deposit of 25 percent of the selling price. Unless you have made prior arrangements with the auctioneer's office, that will have to be paid in cash. A period of two days is then allowed for the balance to be paid in full. So far as computing equipment is concerned, it is desirable that you pay in full at the time of sale and take home your purchase without delay. On the fall of the hammer, the lot becomes your property and another two days in the saleroom among old beds and wardrobes will not improve its performance.

Some people are nervous about buying at auction because of saleroom mystique. They imagine that a surreptitious yawn or involuntary twitch might well lead to a hefty bill for an IBM super system. Nothing could be further from the truth. Once you have entered the bidding, the auctioneer will make a point of looking at you as the price increases. A shake of the head is all that is required to demonstrate lack of interest. Having said that, I once bought a Ford Escort at a car auction while waving goodbye to a friend but that is another story.

As well as hardware, software and books can often be bought at a huge discount in the saleroom. Recently I acquired 11 new books for the Commodore 64 for £18 – no VAT. The retail value of the books was £75. The fact that I already had two of the titles provided an opportunity for some haggling with a fellow buyer. Two swaps were agreed amicably and everyone was happy.

If you are buying job lots of books or software, it is likely that you will have a few duplicates. Although it may be easy for you to sell them to friends, it may be more convenient to trade your surplus items at the saleroom. Never be afraid to approach another buyer and suggest a deal. They can only say no but will probably be grateful you took the initiative.

Perhaps the best value I have seen at a software sale was 75, mostly different, Atari disc games which sold for £15. Fifty Patro cassettes for the Dragon 32 could fetch only £3.50 – total cost – and 24 Straight Dealer tapes for the Spectrum 48K went for £2.

Blank tapes, unformatted discs and even computer stationery can be obtained at bargain prices, provided you choose your sale with care. One type of auction it pays to treat with a little caution is a Post Office sale, where parcels which have been lost or damaged in the post are sold. Unfortunately, in auctions of that type, it is the tradition to sell goods without prior viewing. As many of the lost packages are returned to the manufacturers under guarantee, it is not worth gambling more than a few pounds, however attractive the bargain may seem.

Beware of addiction

A word of caution. The excitement of bidding in an auction stimulates the most level-headed consumer, whatever the size of his bankroll. Sale after sale, devotees return to enjoy the thrill of live, commercial chance. Beware that you do not become an addict and forsake the excitement of computing for the business of the auction room.

Sale room bargains

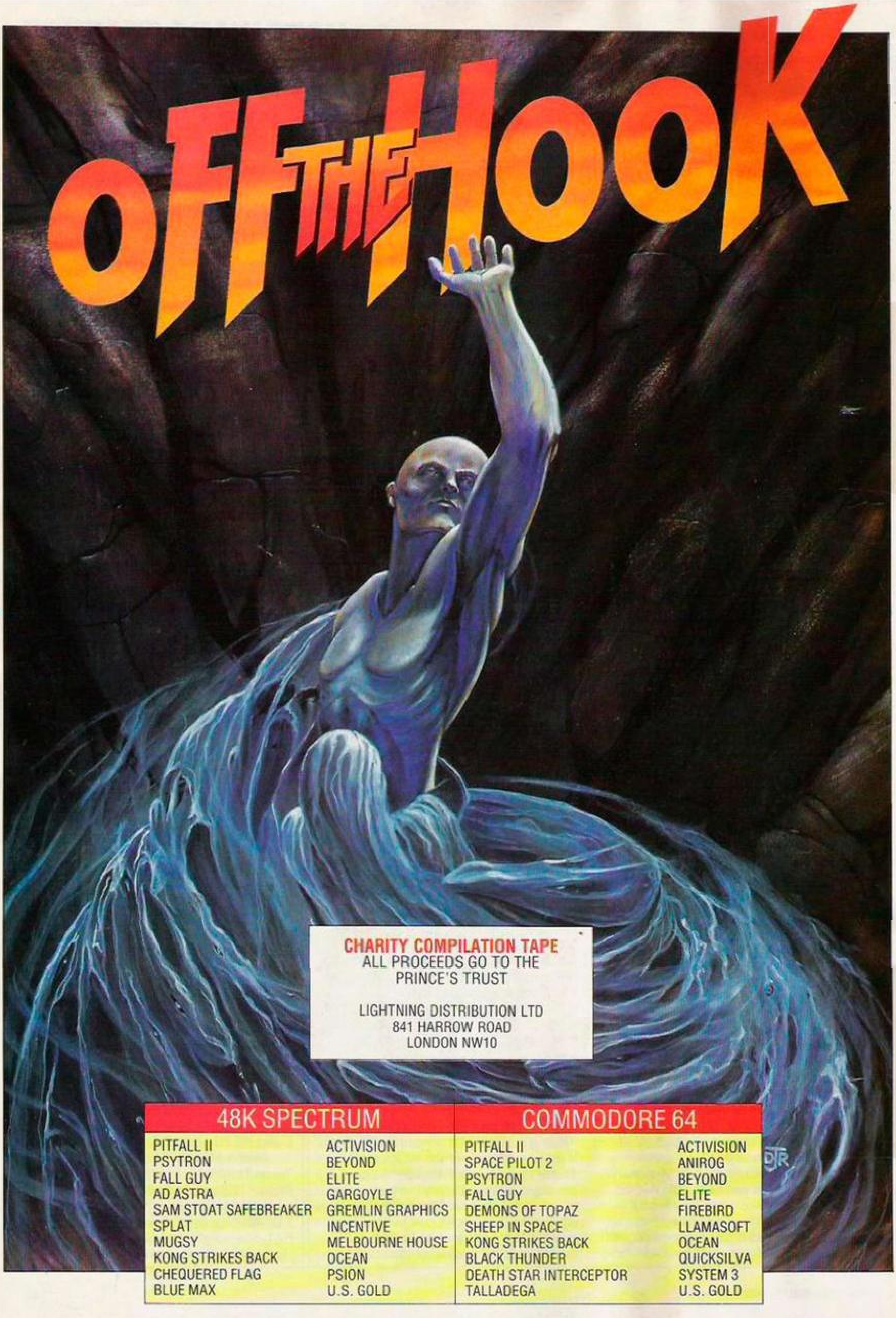
Software and Books – no VAT on books	£
14 books – various, ZX Spectrum	6
16 books – various, Dragon	5
16 books, Amstrad	16
11 books, Commodore 64	18
15 miscellaneous games for Amstrad	11
Amsword word processor and screen designer	32
1 data gun and 1 integrated accounting system for BBC	20
30 Nashua 5¼in. diskettes and disc drive cleaner	24
9 copies of *Spirit of the Stones* (CBM 64)	13
9 statistics cassettes (Atari)	2
75 assorted disc games (Atari)	15
8 cassettes for Texas TI 99/4A	2
12 educational cartridges for TI 99/4A	7
8 educational packs for CBM 64	7

Hardware

Item	Selling price (£) (VAT to be added)
Atari Touch Tablet plus software	15
Atari disc drive 1050 with DOS 3	62
Cumana disc drive (BBC micro)	36



Item	Selling price (£) (VAT to be added)
Cumana dual disc drive (BBC micro)	75
Sharp 700 computer (Model MX 711)	64
Atari computer cassette unit	11
Commodore 16K starter pack	54
Amstrad CPC 464	190
Acorn Electron	52
Acorn Electron plus 3in. disc drive	120
Atari 800XL (64K)	50
Epson printer (RX 80 F/T+)	130
Amstrad CTM 640 colour monitor	78
Micro Writer Model DFA	12
Commodore Plus 4	45
Casio PE 10 personal computer and database	25
Texas TI-99/4A	36
Protek 1200 modem, Spectrum interface	41
5 Datel voice synthesisers	20
RAT, Stack light pen, 2 Atari interfaces	16


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ALL PROCEEDS GO TO THE PRINCE'S TRUST
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SPLAT INCENTIVE
MUGSY MELBOURNE HOUSE
KONG STRIKES BACK OCEAN
CHEQUERED FLAG PSION
BLUE MAX U.S. GOLD
COMMODORE 64
PITFALL II ACTIVISION
SPACE PILOT 2 ANIROG
PSYTRON BEYOND
FALL GUY ELITE
DEMONS OF TOPAZ FIREBIRD
SHEEP IN SPACE LLAMASOFT
KONG STRIKES BACK OCEAN
BLACK THUNDER QUICKSILVA
DEATH STAR INTERCEPTOR SYSTEM 3
TALLADEGA U.S. GOLD
DTR

GUIDE TO THIS MONTH'S REVIEWS

AMSTRAD CPC
Werner

SPECTRUM
Survivors

BBC
Sentinel

C64
Sentinel
Flash Gordon
Master Chess
Storm
Arcticfox

VARIOUS
Breakthru
Donkey Kong
Gauntlet
Tarzan
Xevious

Software Shortlist

Each of the games reviewed in Software Shortlist has been reviewed extensively by our team of reviewers. We do not include reviews of unfinished products in this section of *Your Computer*; they are the games you can buy now or in the near future. See the Software News and Preview features for advance news of games being developed.

Soft Star

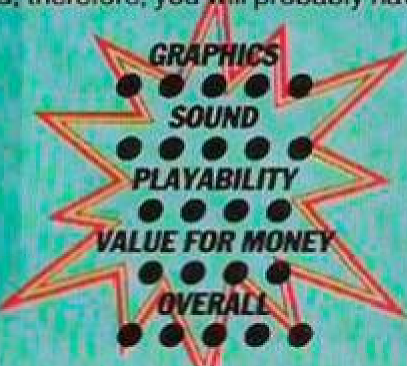
Watch for the *Your Computer* Soft Stars. They are awarded to games which, in our opinion, offer outstanding value.

GAUNTLET

► *Various ● U.S. Gold ● Arcade/adventure ● Francis Jago ● £9.95*



Finally it has arrived. By that I do not mean that U.S. Gold is late launching the game – just that with the way this magazine is produced, this game missed the January issue by a matter of minutes and, therefore, you will probably have



made your decision about it rather than waiting for this review.

If you bought the game, relax, for it is undoubtedly the best version and for anyone who knows and loves the arcade game, it is the only version immediately familiar both to look at and play. Having recovered from the immediate shock of having my copy, albeit an early version, I delved further to check how well the conversion had been achieved.

Levels 1 and 2 are disconcertingly sparse and, therefore, the unmarked floors disguise the feeling of movement. From level 3 onwards, however, the game comes into its own – ghosts, demons, wizards and a plethora of other baddies, all equally well-defined, with only one objective – to kill you.

Each of the characters is excellently defined, with Thor in particular being a personal favourite. All the little touches from the game are there, including the exit on level 5 which takes you to level 8, and some fiendish treasure rooms which certainly make the adrenelin flow.

The music, created by Ben Dalglish, is faithful to the original and the effects are neat and suitable. To conclude, *Gauntlet* will by now have been the Christmas number one and, contrary to most people, I feel it deserves to be. It is one of the best arcade conversions yet and two-player mode is really good fun.



BREAKTHRU

▶ *Various ● U.S. Gold ● Arcade ● Francis Jago ● £9.95*



Two out of three is not bad. The three in question are the three arcade licence conversions launched this month and the two are those which are worth buying. *Xevious* and *Gauntlet* are both high-profile arcade licences which have lived up to, if not exceeded,

GRAPHICS
●●
SOUND
●●●
PLAYABILITY
●●●
VALUE FOR MONEY
●●
OVERALL
●●

expectations. *Breakthru*, on the other hand, was a good arcade game which



has not translated well to the home computer.

The aim is to drive your dune buggy through various courses until finally you can reach and destroy the enemy headquarters. To help in your conquest, the buggy is equipped with the ability to jump and shoot, enabling mass destruction to be the order of the day.

As a game, the Spectrum version is, for the machine, a great deal better than the Commodore version. Where the Spectrum version at least plays well, the Commodore version appears to have been rushed, with both graphics and gameplay suffering. The five levels, each displayed as a map on the overview, consist of a mountain section, a bridge, a prairie, a city and, finally, the airfield. What is most frustrating about the game, apart from the inherent problems from the arcade game, is that there is no desire to play. Dying is more of a relief than an annoyance.

Overall, Breakthru is not the arcade game to buy this month. U.S. Gold has two classics in its catalogue but Breakthru is not the third.

DONKEY KONG

▶ *Various ● Ocean ● Arcade ● Peter Luke ● £8.95*



A new release from Ocean. What? *Donkey Kong?* Was that not an arcade game about four years ago which spawned numerous clone games? To answer those questions, this 'new' release is, in fact, the official version, even if it is a few years late.

Staying very close to the original, only without the cuddly character – called Mario, I believe – the game still has you trying to rescue your fair maiden and dodging barrels, fireballs, custard pies *et al.* It is created by Arcana Software, the company which recently received praise for its Trivia-type game, *Power Play.*

Graphically, Donkey Kong is not bad and is just as much fun to play now as it ever was but that still is not sufficient to justify a price identical to games such as *Sentinel* and *World Games*, which are state-of-the-art in graphics, sound and gameplay.

Priced as it is, Donkey Kong, is poor value. It lacks everything which distinguishes full-price games from their budget brothers. Once you have

GRAPHICS
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SOUND
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PLAYABILITY
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VALUE FOR MONEY
●●
OVERALL
●●●

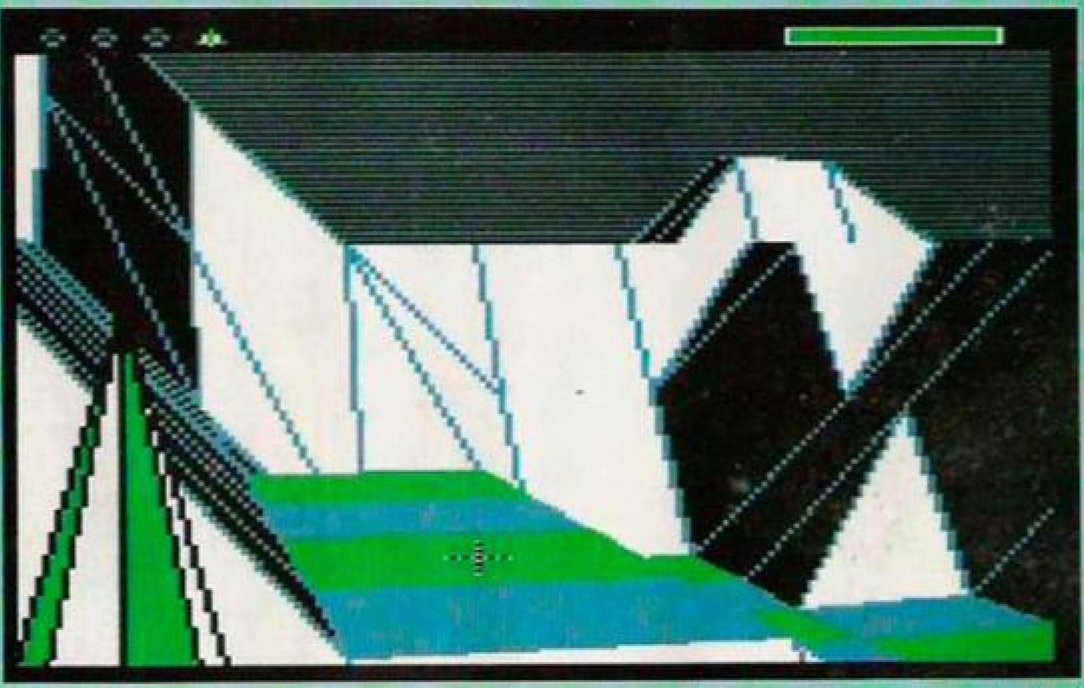
completed all four levels, something a competent gamer could achieve in less than an hour, the game just repeats, a little more difficult but not much else.

If Ocean had a budget label, this would have been the hit of the year and it would probably have made more money than releasing it as a poor, full-price game.



SENTINEL

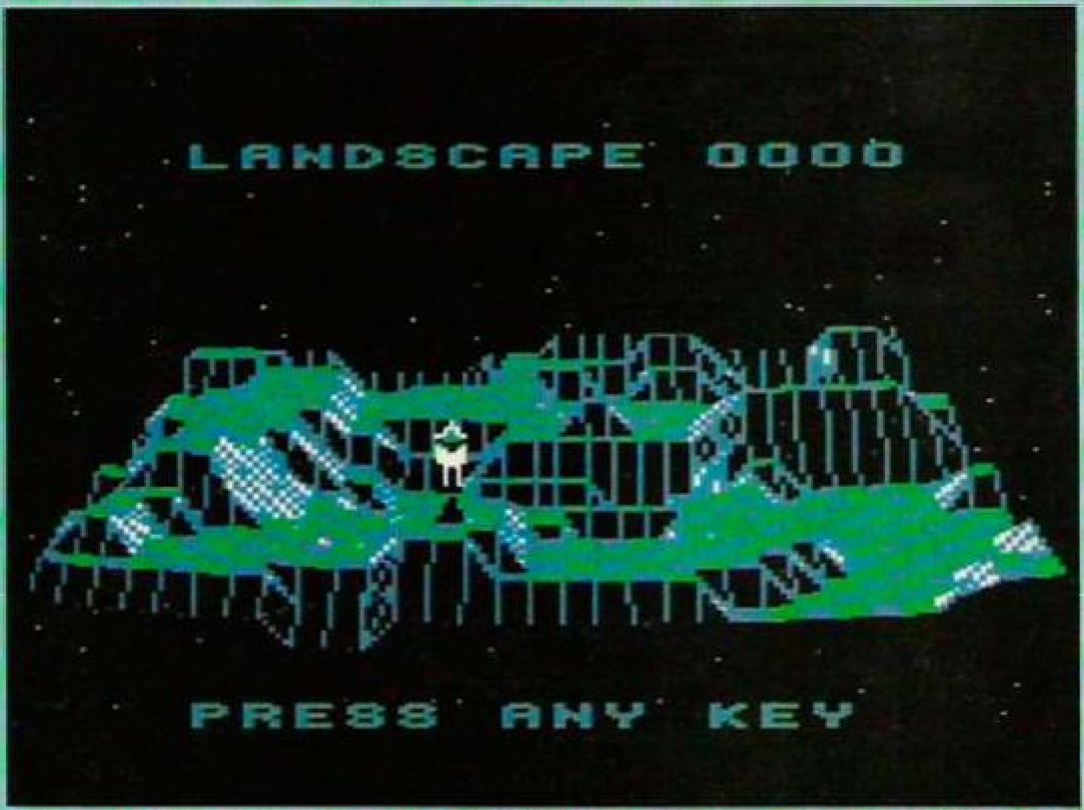
► *CBM 64/BBC* ● *Firebird* ● *Strategy* ● *Francis Jago* ● *£9.95*



Unbelievable is the only suitable word to describe this game. Anyone who has played games on the BBC will be more than familiar with the author of *Sentinel*, Geoff Crammond, the man responsible for *Aviator* and *Revs*. With Sentinel, however, he has excelled himself. In many respects, it is the most innovational game released for the Commodore 64, combining elements from every aspect of game playing and resulting in nothing short of a classic.

To complete each level you must absorb the Sentinel, who is the all-seeing, all-listening enemy at the top of the landscape. To do so, you must build blocks upwards and scale the landscape gradually until you can see the base on which the Sentinel stands; then you must absorb him.

The early levels, up to about 50, are relatively easy. The Sentinel is on his own and the landscape is not too severe. Considering, however, that there are 9,999 individual landscapes, you can imagine that later the game becomes extremely difficult. The graphics depend on mathematical accuracy rather than pure aesthetic beauty to create the landscapes, and the animation as you pan round is semi-flick scrolling but very effective.



Unlike many of the more recent games released by Firebird, Sentinel has no Rob Hubbard soundtrack and the game relies on very basic sound effects to create a feeling of atmosphere – but it works. The short jingles used to indicate various actions such as transform and hyperspace are clear and very effective.

If you manage to absorb the Sentinel, you must then move on to his podium before hyperspacing. Once that has been done, and depending on how much energy you have remaining, the computer will decide to what level to move you. At each level the computer gives you an eight-digit password so that you may access the same level at a later date.

There are people who find Sentinel not enjoyable to play but, in my view, missing the game is a crime. It is the most outstanding piece of software I have played on the Commodore and deserves every bit of praise it receives. Unless 1987 is a really great year, it may receive my vote for game of the year.





WERNER

► *Amstrad CPC range* ● *Ariolasoft* ● *Compilation* ● *John Barnes* ● *£8.95*



Werner is a Grolsch-drinking German character who not only enjoys a good bet but is also a bit of a biker. Supplied on disc there are five different games which can be played – diddling, motor ride, panic tour, motor bike assembly and drive in the fog. The German origins of the game probably account for the unusual scoring system which charts progress in bottles of beer.

The exceptional feature of *Werner* is without doubt the quality of the graphics. More like a cartoon than a computer game, you are able to help the zany character play dice, go on a crazy motor ride dodging flying melons and electric drills which have taken a life of their own, and go for a pleasant drive in the country where it is important to collect a variety of objects found littering the autobahn.

Werner is also one mean mechanic and has a massive selection of motor parts in his garage. Armed only with four crates of beer, you must build a roadworthy motorbike before you run out of ale and then take the super machine out for a relaxing spin in the fog.

Not many games rate very highly on our zany wackometer but Werner certainly obtained a high score and should not be missed by anyone of a slightly wacko disposition.

GRAPHICS
● ● ● ● ●
SOUND
● ● ●
PLAYABILITY
● ●
VALUE FOR MONEY
● ● ●
OVERALL
● ● ●



TARZAN

► *Various* ● *Martech* ● *Arcade/adventure* ● *Peter Luke* ● *£8.95*

Ah, ahahaha, ahahaha. You hear the familiar cry of *Tarzan*, Lord of the Apes, and then, in the distance, the rhythmical beat of the bongos. That is how the latest game from Martech starts and, in some respects, the time spent loading is the best.

Starting with a sampled cry, the loading then jumps, on the Commodore 64 version, to the latest and greatest Rob Hubbard soundtrack. With a full rendition of the well-known and loved tune, and some amazing-sounding drums and bongos, Hubbard has really excelled himself with the music on this game. He really must like Martech.

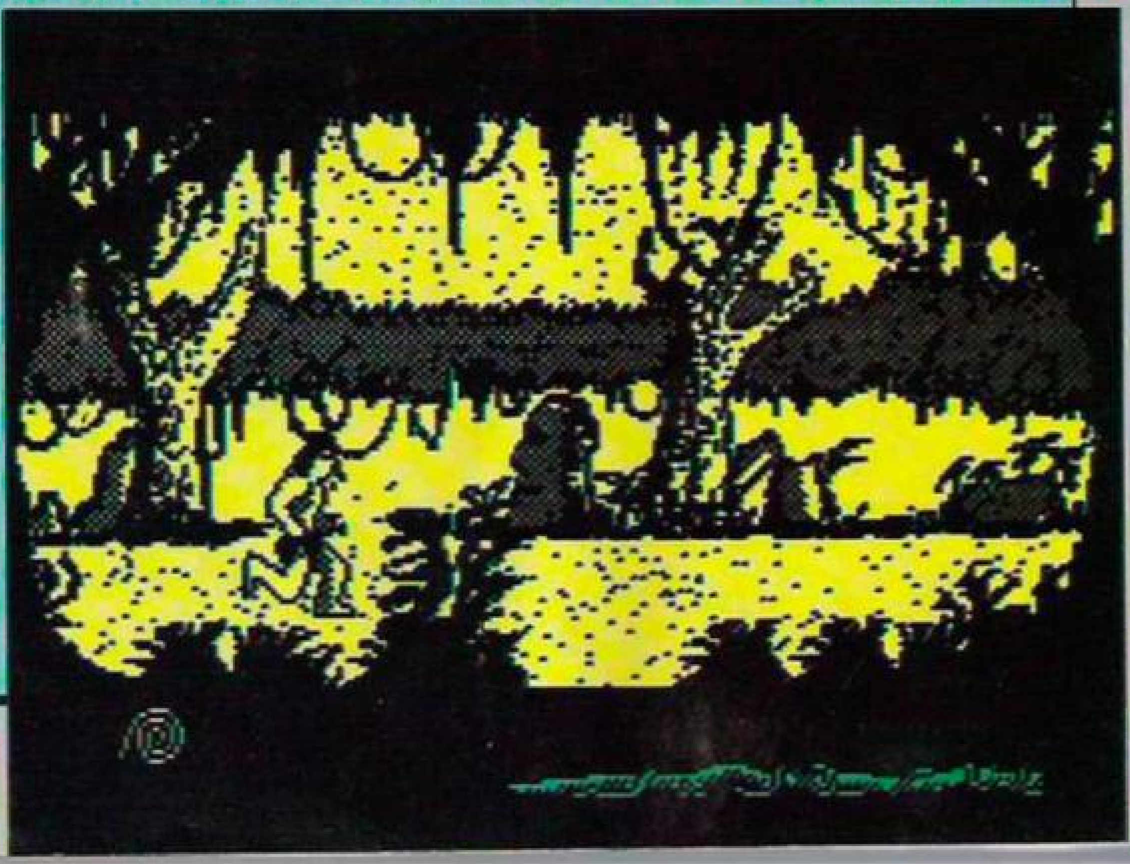
Once the game has loaded, the first thing to strike me was the similarity between the graphics and animation in Tarzan and the graphics in that other recent arcade adventure, *Antiriad*. In fact, the definition of the main character sprite is very close, right down to the wavy hair and hunky body.

Although the storyline is meant to be based on the adventures of Tarzan, it is a fairly standard arcade adventure, although in this instance Tarzan is out to save his wife who has been kidnapped by the evil Usanga, Chief of the Wamabo.

To complete the task you must collect the seven gemstones the chief wants and then he will release Jane.

Overall, Tarzan is not really up to the usual standard of Martech, which is surprising as it is its biggest licensing deal yet, but we all know it is quality, not quantity, which counts.

GRAPHICS
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SOUND
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PLAYABILITY
● ● ●
VALUE FOR MONEY
● ● ●
OVERALL
● ● ●



XEVIOUS

► *Various ● U.S. Gold ● Shoot-'em-up ● Francis Jago ● £8.95*

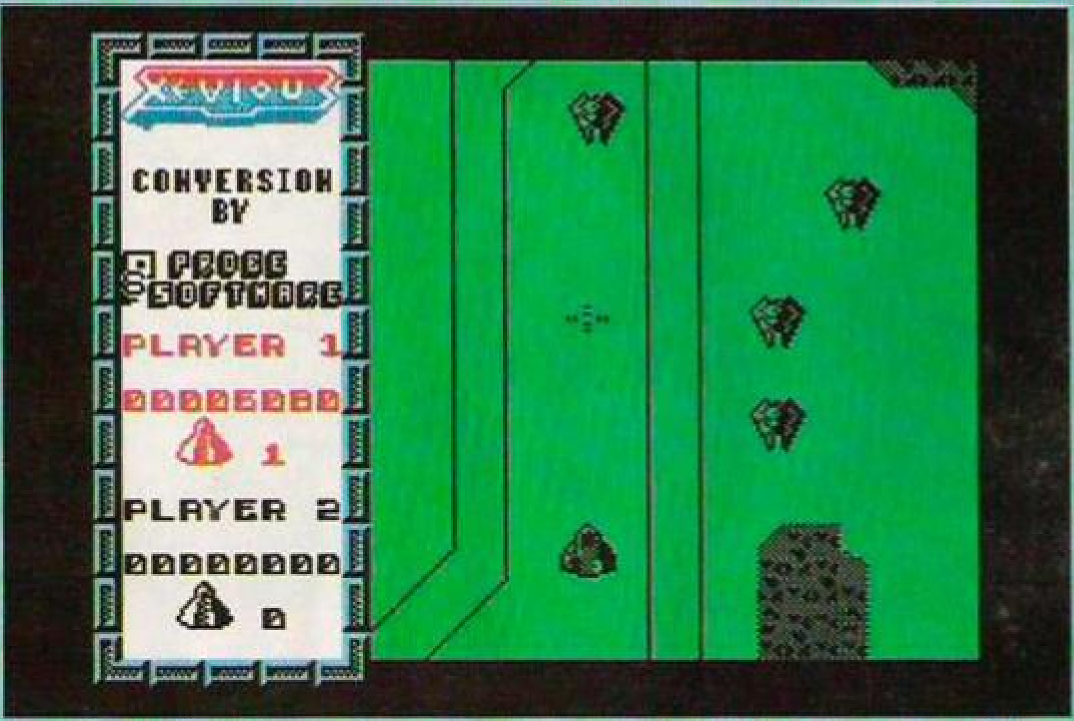
Many eons ago, even before U.S. Gold bought its first arcade licence, an advanced technologically-orientated civilisation was forced to evacuate the Earth prior to the Ice Age. Now the

GRAPHICS
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SOUND
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PLAYABILITY
● ● ● ● ●
VALUE FOR MONEY
● ● ● ●
OVERALL
● ● ● ●

Xevious people are returning to reclaim their heritage through conquest.

That is the scenario which the latest arcade shoot-'em-up, Xevious, uses as a background for its shoot-and-dodge gameplay. Anyone who has been to the arcades and played Xevious will immediately recognise the conversion, as it retains both the attack waves and game structure.

Programmed on the Spectrum, the first version to be completed by Probe Software, it is one of the best shoot-'em-ups programmed on the Spectrum and is up there with *Lightforce* and *Uridium*. The graphics and animation are excellent, with a huge variety of spinning



and twisting aliens and totally smooth vertical scrolling.

At first, the game appears to be a little simple but having played it for a few hours, I can vouch for the fact that some of the later levels are, to say the least, infuriating. By including the fire and bomb on one button the programmers have made the killing of the ground bases less of a struggle, although at some points it still becomes incredibly hectic.

As with all good shoot-'em-ups, points are accumulated by the thousand, with anything above 50,000 being no mean feat. With both Xevious and Gauntlet in its catalogue, U.S. Gold has two all-time arcade favourites, both excellently converted, and available on time. What more could anyone ask?

ARCTICFOX

► *CBM 64 ● Ariolasoft ● Tank/arcade ● John Barnes ● £9.95*

Electronic Arts, the company which originally produced *ArcticFox* for the U.S. market, has not really achieved the success it expected to do in the U.K. The only real hit it had in the last few years was *Skyfox* by Ray Tobey. As the ties between Ariolasoft and EA seem to be ending, both parties are hoping that the last release, ArcticFox, will match the success of the other Fox.

Anyone who remembers the Arcade classic *Battletank* will immediately feel at home with ArcticFox, as the idea behind the game is similar. Graphically, the screen is very well-laid-out. A full control panel dominates your view, with indicators showing direction, speed and which weapons you are using, among other things.

The rest of the screen is used to show a forward view from your tank, generally of the vast expanse of snow in front of you. The aim is to penetrate the enemy camp and destroy the headquarters. To help you in your task, the tank is equipped with rockets, missiles and the ability to drop mines where necessary.

Although by no means fast, the animation in ArcticFox is fast enough to make the game playable, unlike some true 3D simulations and the various enemies are excellently-defined. Having played the original version of the game, written for the Commodore Amiga, I was pleasantly surprised to find that the 64 version is, if anything, more fun to play, although the graphics are understandably less impressive.

ArcticFox is a good fun tank game, with a large element of tactical play required to get anywhere. Not as good as Skyfox but all the same a good game to finish the EA/Ariola relationship.

GRAPHICS
● ● ● ●
SOUND
● ● ●
PLAYABILITY
● ● ● ●
VALUE FOR MONEY
● ● ● ●
OVERALL
● ● ● ●



Budget Software

STORM

► C64 ● Mastertronic ● Arcade/adventure ● Francis Jago ● £1.99



OVERALL ● ● ●

Dandy too expensive? *Gauntlet* too gargantuan? *Avenger* too awesome? Then what you need is a dose of *Storm*. Mastertronic has released, at its usual price of £1.99, a two-player game which bears a remarkable similarity to the well-known game which U.S. Gold has recently released.

The object is to travel round maze killing various baddies and collecting all the scrolls and amulets until you have travelled far enough into the maze to Corrine, the beloved wife of Storm.

In two-player mode, you and a friend can assist each other and, if played well, you can travel through a few levels without even getting close to death.

My only real criticism is in the method of control; unlike any of the other Gauntlet clones, Storm requires a point-and-push method of movement and becomes annoying when you are in a tight spot. Apart from that, Storm is another good offering for the Commodore. There is an excellent Whittaker soundtrack, too.

MASTER CHESS

► C64 ● Mastertronic ● Chess ● Jake Doxat ● £1.99



OVERALL ● ● ● ● ●

How many really good strategy games can you buy which cost less than £2? This latest Mastertronic game involves a great deal of strategy and yet still has sufficient action to keep almost everyone glued to the screen. It involves you fighting a battle against the computer, with each side having various members of various power.

If one player's piece lands on the square occupied by that of another player, and the first piece is more powerful than the latter, the first piece will win the fight and overtake the square. That continues for some time until one or other team has the opposing team leader in a position which restricts him from moving, then that team will have won.

The graphics and sound are good, the reaction time of the computer opponent is excellent, and the game is relatively easy to use.

FLASH GORDON

► C64 ● Mastertronic ● Arcade/adventure ● Francis Jago ● £2.99



OVERALL ● ● ● ● ●

Budget games which use tie-ins are, to say the least, rare, mainly because the initial licence costs so much that companies are desperate to try and recoup some of their money and are therefore not anxious to sell the game at a budget price. If, however, anyone knows what will and what will not succeed in the budget market it must be Mastertronic and consequently I expect its first licence, *Flash Gordon*, to be a massive success.

The game is basically a multi-load, three-part adventure with you taking on the role of Flash Gordon, trying to save the world from the evil Ming. The first section has you running through the jungle, shooting various baddies and mapping-out the area. Part two involves some natty martial arts moves and the last section is a *Ballblazer*-style bike chase, killing all the burdmen who are intent on your destruction.

Good graphics, an excellent Hubbard soundtrack and only £2.99 must make it the budget sensation of the year.

SURVIVORS

► Spectrum ● Atlantis ● Boulder ● Francis Jago ● £1.99



OVERALL ● ● ●

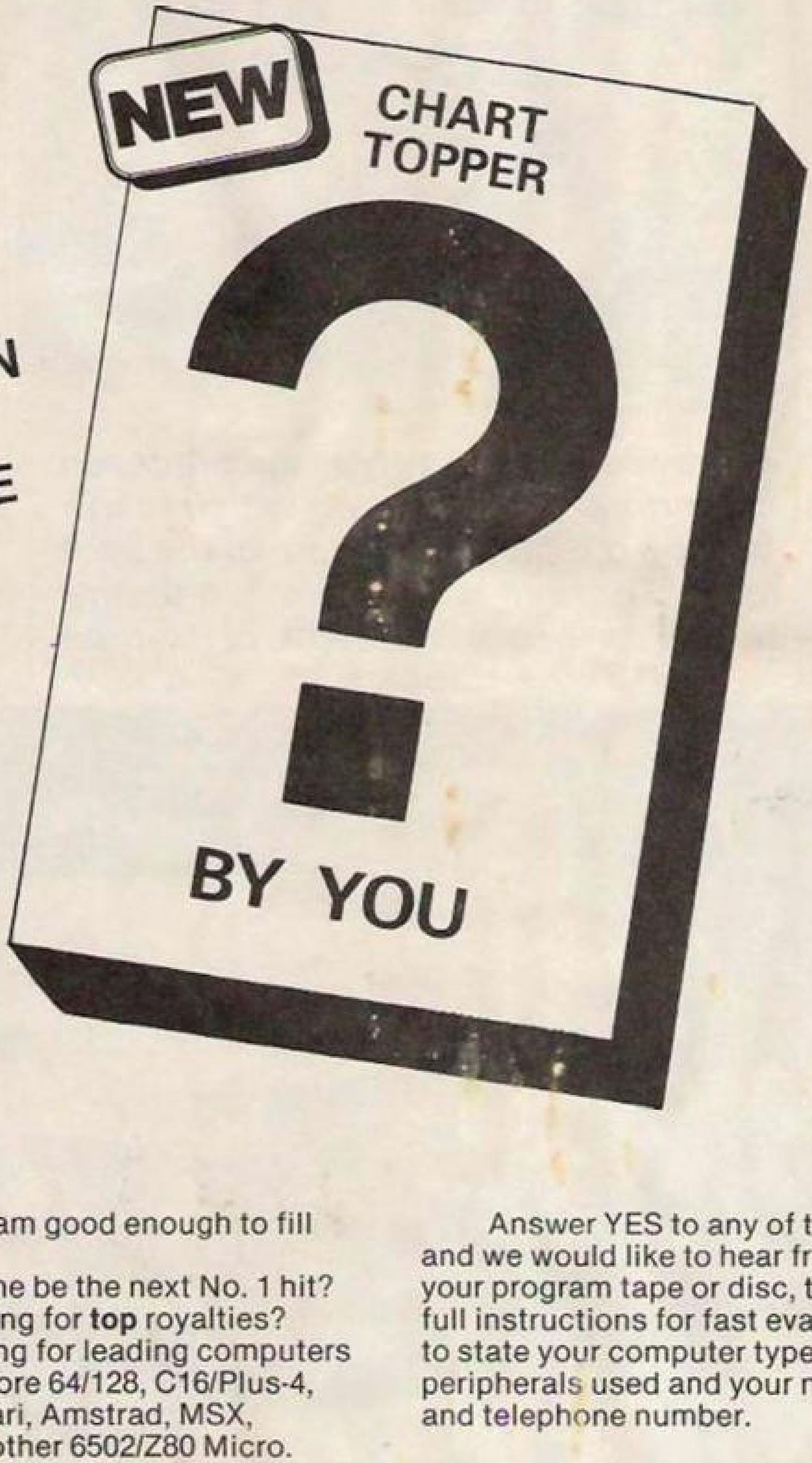
Boulderdash was an all-time classic home computer game. Nothing previously had managed to capture the addictiveness or the sheer annoyance of being so close to completion of the Xth screen but not achieving it.

Survivors, from Atlantis Software, shares certain ideas with Boulderdash and another arcade classic, *Dig Dug*. In Survivors, it is your task to rescue almost 1,000 survivors of a nuclear war, hence the name of the game. To do so you must guide three droids through the seven levels and then teleport the survivors out.

Graphically, the game is good, although by no means special. It combines a relatively simple idea with a slightly more complicated plot to produce a fun, although basic game.

It is, in the truest sense of the phrase, cheap and cheerful.

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Printers on parade

There are now many types of printer on the market and deciding which to buy can be a difficult decision. In the final part of our series on printers, Anthony Thompson compares some of the most popular.

The most common computer peripheral must be the joystick. Close behind but far ahead of modems, disc drives and hard discs, would be the printer. Originally, printers fell into the category of items for which most owners wished but few could afford. Today, prices are falling fast and more people are discovering the benefits of producing hard copies of their work.

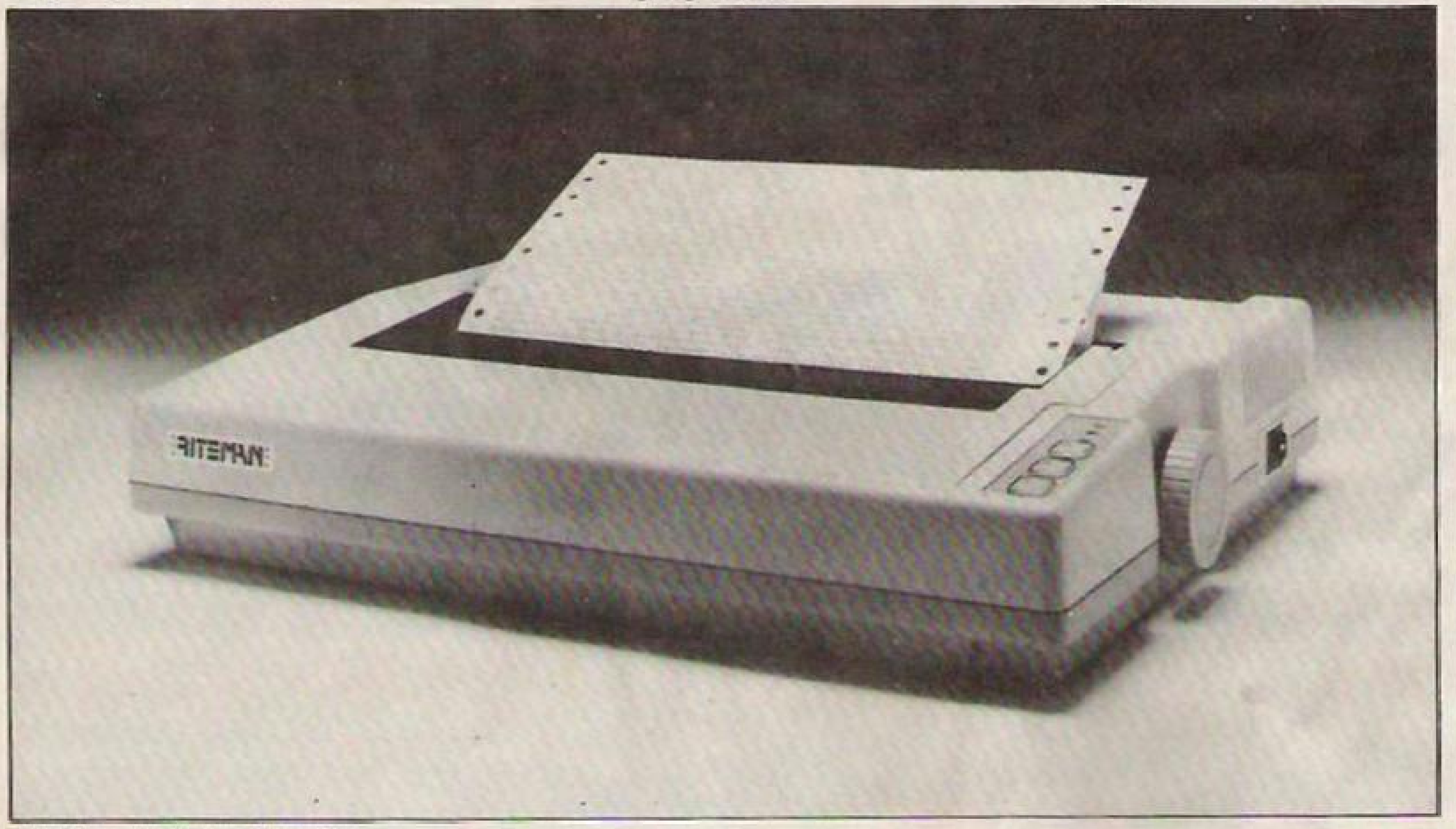
Word processing is the latest trend to take the market by storm and is undoubtedly the major reason behind many printer purchases, yet even if word processing does not interest you, there are still many benefits from owning a printer. They can prove immensely useful when debugging programs, since correcting and checking from a printout is far easier than on the screen, the main advantage being that you can view the program as a whole, instead of scrolling through a section at a time.

Your intended use of a printer will determine which type is best suited to you. If your primary usage would involve word processing, print quality is obviously a major concern. Daisywheel printers produce the highest quality print and are usually designated letter quality. It is possible to buy dot matrix printers capable of producing letter-quality print but they are normally more expensive.

A fast-growing standard among dot matrix printers is near letter quality. In that mode, each character is printed twice, the second time with the printhead displaced half a dot sideways. That produces a darker finish and, while close inspection usually will reveal that the letters are composed of small dots, the quality is good enough for most correspondence.

Most dot matrix printers have a printhead composed of nine pins, although usually only eight are used. The latest development is the 24-pin dot matrix printer. Larger manufacturers such as NEC have been making printers of this type for many years, at a price which reflects the quality of the machines. As the available technology reaches ever higher standards and manufacturing costs continue to fall, 24-pin printheads will fall in price and become available to a larger proportion of the market.

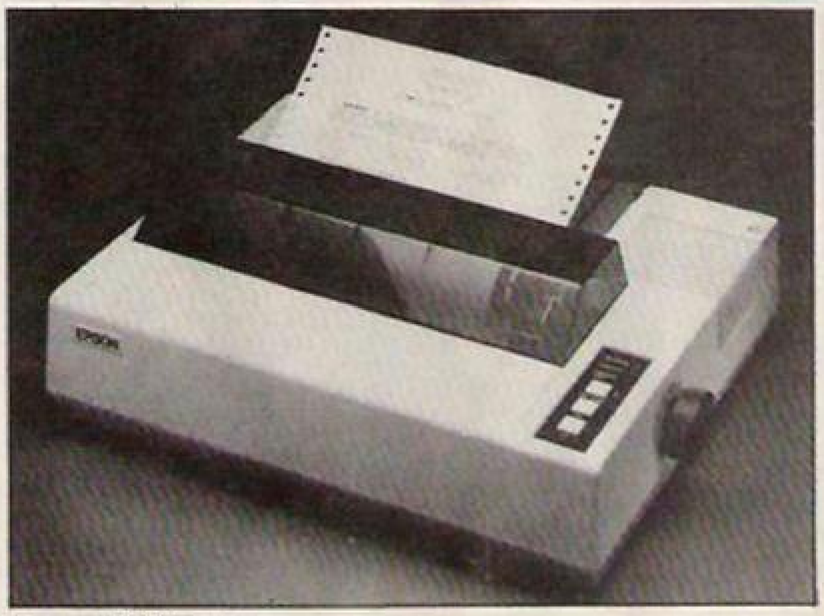
A major disadvantage of the daisywheel printer, in addition to its slower speed of operation, is that it has no graphics ability. The best of both worlds, however, is available – at a price. The Brother Twinwriter combines dot matrix and daisywheel heads in one machine. That permits the user to produce high-quality text and graphics with ease on the same page.



A high-quality dot matrix printer.

Another development, aimed more at the business than the home market, is the ink-jet printer. They emulate the action of a printing pin by squirting ink through very fine holes. Their major advantage over the dot matrix and daisywheel varieties is their quiet operation. As no mechanical parts touch the paper of the printer cylinder, ink-jet printers are virtually silent when working.

Although expensive initially, the price of the machines is also falling to a level which many more people can afford and they are bound to be a competitive force,



Epson MX80 printer.

especially in the small business sector, for many years.

The most expensive type is also falling in price and gaining in popularity. Desk-top publishing is a fast growing industry and the laser printer is at the heart of most systems. They use laser light to reproduce images on paper and, in reality, are more similar to photocopying machines.

Their ability has made them perhaps the most sought-after printer for many. It will, however, be many years before prices fall to a level acceptable to the average home user.

Name	Price	Type	NLQ	Draft speed	NLQ speed	Graphic capability
Brother HR-5	£99.95	Thermal	No	30	—	Yes
Quendata DWP 1120	£139	Daisywheel	Yes	—	20	No
Commodore 801	£129 + VAT	Dot matrix	No	100	—	Yes
Amstrad DMP 2000	£160	Dot matrix	Yes	100	20	Yes
M1009	£169	Dot matrix	No	50	—	Yes
Citizen	£175	Dot matrix	Yes	120	25	Yes
Kaga KP810	£199	Dot matrix	Yes	160	—	Yes
Commodore 1101	£199 + VAT	Daisywheel	Yes	—	20	No
Epson LX-80	£225	Dot matrix	Yes	100	16	Yes
Star NL-10	£229	Dot matrix	Yes	120	30	Yes
Mannesman Tally MT80+	£229	Dot matrix	No	100	—	Yes
Juki 5520	£399 + VAT	Dot matrix	Yes	180	30	Yes
Brother HR-15	£399 + VAT	Daisywheel	Yes	—	20	No
Juki 6100	£399 + VAT	Daisywheel	Yes	—	20	No
NEC Pinwriter	£496	Dot matrix	Yes	160	60	Yes
Honeywell S32	£595 + VAT	Dot matrix	Yes	150	60	Yes
Juki 6300	£899 + VAT	Daisywheel	Yes	—	40	No
Brother Twinwriter	£1,295	DM + DW	Yes	140	30	Yes

Spectrum to Amstrad Part II – completing the transplant



In this, the last of a two-part article, Richard Sargent finishes explaining how to transfer Basic and data files between these two popular machines.

At the Spectrum end, the Spectrum control program is shown in listing one*. Re-set the Spectrum and enter and RUN listing one. Then LOAD the Basic program you intend to transfer. Find the top of the Basic program by:

```
PRINT ((PEEK(23626))*256)
+PEEK(23627)
```

If the value is less than 39000, a single pass transfer using listing three at the Amstrad end should work. A value of between 39000 and 50000 will probably still allow a single pass but with listing four in control at the Amstrad end. A value over 50000 indicates that the program should be split in two and transferred in two passes, with the listing four control program on the receiving end.

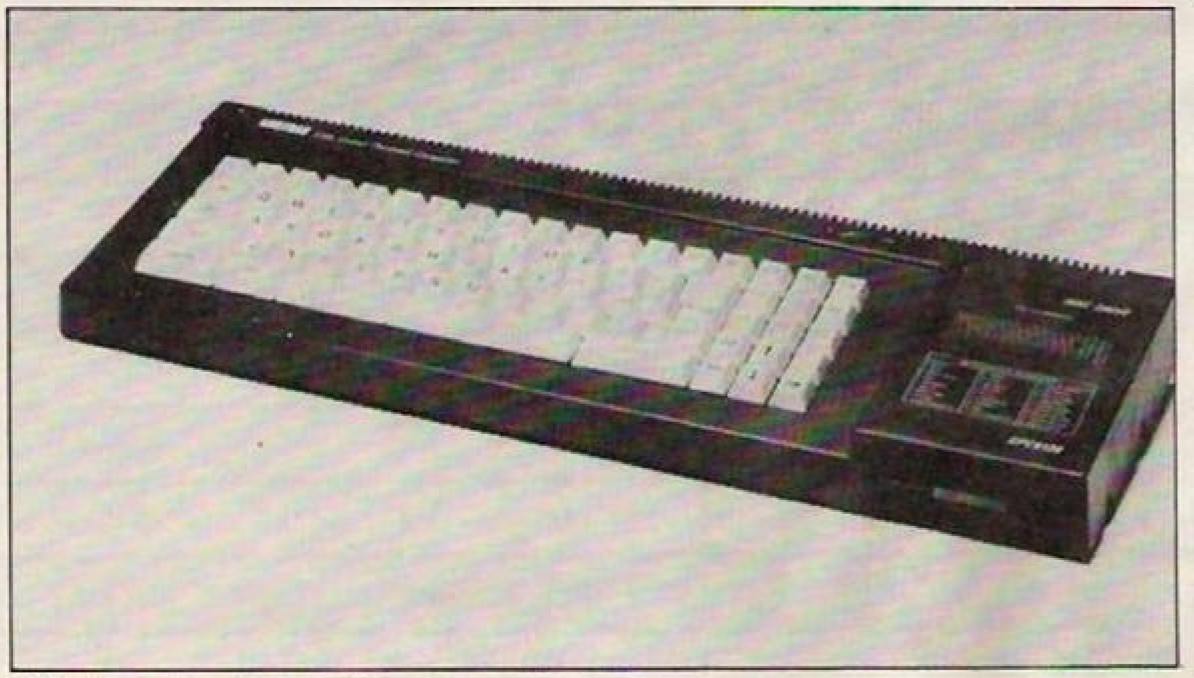
Take this opportunity to make an ordinary LIST of the program to see if it has long lines, such as a single PRINT statement which writes messages to an entire Spectrum screen. Split them so that none is more than 255 characters long. Also scan the listing for graphics and user-defined graphics – they are also likely to be inside PRINT statements.

Cosmetic patterns

If they are important, they will need to be transferred in the [xxx] format explained, so that they can be deleted or changed as appropriate in the Amstrad. If they are merely cosmetic patterns there is a quick way to erase them. Changing the "0" byte at 61532 into a "1" will instruct the transfer program to change all Spectrum characters having codes of 0-31 and 128-164 into an upside-down question mark symbol which a word processor at the Amstrad end can remove or change easily. The upside-down question mark is stored at location 61533 and you can POKE in a different symbol there if wish.

The manual adjustment of the Spectrum line length to 255 characters or fewer is not essential, since the transfer program will detect long lines and insert a carriage return after 255 characters. Location 61529 holds the 254 value. It can be changed with a POKE. The significance of line width is explained later.

The Spectrum has many quirks and patching into the LLIST and LPRINT ROM routines is not so straightforward. Thus the transfer control program does not really interact with LLIST and LPRINT. Rather it takes a back seat while LLIST and LPRINT go through their pre-allocated paces. The transfer control



All listings shown last month.

program is somewhat quirky, in that it does not re-set itself automatically, so that always before a LLIST you must type RANDOMIZE USR 61440. Also it must have a special marker placed at the end of the listing so that it knows when the listing has ended and can save the final segment to safety on the tape recorder before the Spectrum operating system clears the screen holding the final segment. This marker is the copyright symbol followed immediately by upper-case X. The last line of the program to be transferred should thus have REM © X typed into it.



Copyright-X

LPRINT: You can use purpose-written programs containing LPRINT to send portions of data, such as the contents of arrays, to the Amstrad. Here are three ways of sending the contents of A$ and B$:

```
10  RANDOMIZE USR 61440:
    LPRINT A$;B$"©X"
20  RANDOMIZE USR 61440:
    LPRINT a$+B$+"©"
30  RANDOMIZE USR 61440:
    LPRINT A$;:LPRINT B$;"©X"
```

If an LPRINT is working inside a FOR..NEXT loop, it can quickly output sufficient data to fill a 1B00H VRAM segment. The ©X terminators can be placed anywhere but it is important to note that the rule governing LPRINT transfers is that a RANDOMIZE USR 61440 should precede any LPRINT(s) terminated by a copyright-X. There can be any number of LPRINT statements between the RANDOMIZE USR 61440 and the first occurrence of copyright-X.

At the Amstrad end: For important transfer work, the Protext word processor is ideal for accepting the .ASC files since it can cope with long lines. Long lines cannot go directly into Amstrad Basic, so they are split at the 255 position before they leave the Spectrum.

Abandoned load

The split line is recognised instantly in the word processor. It still does not allow direct loading into Amstrad Basic, since the tail-end part of the split line has no line number and is seen either as a syntax error or as a direct command by Basic which will cause the load to be abandoned. Users without word processors must break long lines manually in the Spectrum listing – and at the Spectrum end – if the transfer is to work.

The machine code loader is shown in listing two. Re-set the Amstrad and load and RUN listing two. It will save the machine code on disc or tape as a file called "ZX.BIB". The program is self-contained and needs only to be told the load address for the first segment, stored at &8004/8005. It reports to Basic by placing a zero in location &8006, if a tape-loading error occurs, and by placing the length of the segment currently accepted in locations &8007/8008.

Listing three, the Basic control program, is suitable for most medium-sized transfer programs. Tape-only CPC464 users must remove :DISC and :TAPE.IN. Users without the Utopia sideways ROM must remove :NOKEYS. The program from here is self-explanatory, except that the upside-down question mark is produced by function key 9, instructed by line 120.

Intervention

An alternative control program which accepts one segment at a time and saves it to disc/tape before loading another segment is shown in listing four. If you have a disc no human intervention is needed and the program will lay down a neat series of labelled .ASC files on the disc. Re-assembling the .ASC files from disc or tape into a coherent whole is a task which a word processor with a MERGE facility will do well.

Tape-only users may find swapping tapes tiresome and breaking the "read only" tab on the source cassette is recommended, as it will remove the danger of over-writing the Spectrum recording with an Amstrad-generated .ASC file. Amstrad users who have access to a Spectrum can now enjoy many hours of transferring precious data from Spectrum to Amstrad systems. Remember, if the Spectrum can LLIST it or LPRINT it, the Amstrad can grab it.

Anyone interested in the first part of this article can obtain a copy of the January issue by sending £1.50 to the Back Issues Department, 79-80 Petty France, London SW1H 9ED.

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COMMODORE

CBM 01

The Birds

Program type: Arcade
Author: Richard and John Palmer

You are the mother of three hungry chicks. Flying from the nest you must dive and collect 20 worms, returning each to the nest inside six minutes. There are seven levels to test your true maternal instincts.

Stellarways

Program type: Multi-player strategy
Author: J. Dakin

This game for two to seven players has you bidding for the rights to build inter-stellar travel stations. The object is to stay ahead of the competition by expanding your company stations to adjoining star sectors while keeping a share majority and avoiding natural disasters such as black holes, which naturally affect share prices.

CBM 02

Adventure Pencil

Program type: Adventure Pencil
Author: Chris Pile

This is a design aid to help you write an adventure program. The menu-driven Basic program will prompt you for all the information necessary, allowing up to 80 character location descriptions, monsters, weapons and the four basic directions. Once that information has been compiled the program will put it all together.

BASS – Basic ASSistance

Program type: Disc utility
Author: L. Jack

Written in machine code, this disc utility will allow you to perform all those mundane disc commands at the touch of a button. The program caters for disc directory, scratch file(s), re-name file(s), validate disc and digital clock. Once running, a simple SYS call will give access to the system which is run by Macintosh-like menus.

SP 04

Con – Gem

Program type: Utility
Author: William Fong

This utility will enable you to give your programs the professional look. Written entirely in interrupt-driven machine code, the program sets-up sprite zero as an arrow and locks the top line of the display as a command line.

The utility will continue to work independently of any other tasks the computer may be running. The tape includes a simple demonstration program to show how the system works.

COMMODORE

CBM 03

Tidy – 64

Program type: Utility
Author: Graham Blighe

One of the major problems with the Commodore 64 is that to make best use of it all the program statements have to be squashed together, making listings completely unreadable.

Tidy – 64 will change that by changing listings to 'Pretty-print' listings from disc or tape to the screen or printer. In addition to splitting multi-statement lines, inserting spaces between keywords and indenting FOR...NEXT and THEN statements, Tidy – 64 caters for user-defined margins and titles, formatted line numbers and page numbering.

CBM 04

Runner

Program type: Arcade
Author: Ben Kirk

To make a change from the usual slaughter of aliens which seem to descend from a great height, in this game you have to fly over a horizontally-scrolling landscape. During flight you must also battle seven waves of aliens and all the time keep an eye on the fuel gauge and shields.

Bunker

Program type: Arcade
Author: Simon Beesley

The gluks are invading the galaxy and guess who has to defend the bunker? As commander of the bunker you have to destroy the gluk battle fleet using only two laser cannons and a shield to defend yourself. The game is fast-action machine code and an exceptional feature is that one of the guns moves on a diagonal slope.

CBM 05

80-column Screen

Program type: Utility
Author: Roger Kinkead

This utility will give your 64 an 80-column display, just like other micros such as the BBC and Amstrad. Included with the machine code program is a demonstration showing how best to use it.

Mission ZX1

Program type: Arcade
Author: John Storer

Hordes of crazed aliens are descending on your ship and it is not for tea and cakes. Determined to destroy your ship, you will need quick reactions and a fast trigger finger to repel the marauding creatures. In addition to the normal options you can choose the size of the aliens and whether or not there will be any wreckage around which to navigate.

CBM 06

Space Ambush

Program type: Arcade
Author: Michael Solomon

While navigating through deepest space you find yourself under attack by aliens but this is an unusual variation on the alien-bashing theme and includes dual-turreted guns, alien attack patterns and asteroid storms. The game is written in machine code.

VID Basic

Program type: Utility
Author: J. Dakin

One of the flaws with the 64 is its lack of Basic commands for handling the excellent sound and graphics facilities. VID alters that by offering 33 extra commands, accessible either in direct command mode or from your Basic programs.

The screen is split into three sections and each can be accessed individually in high-resolution, extended background mode or any mixture on the screen.

The new commands give Basic access to all the usual facilities, plus hi-res plotting, sprite manipulation commands and full sound facilities.

CBM 07

Boots

Program type: Platform
Author: Mark Mainwood

Boots is a highly-advanced robot who has crash-landed on an uncharted planet. Two types of alien inhabit the planet – the Z-Bots and the Z-Balls; both are hostile. To escape, Boots must be guided through 24 terrifying zones, collecting zyconium crystals on the way which are needed to repair his spacecraft. Plenty of action to keep you up late at night.

Invasion of the Killer Tomatoes

Program type: Shoot-'em-up
Author: Russell Wallace

Hordes of killer tomatoes are attacking earth, falling out of the sky at incredible speeds and smashing everything in their paths. Without the help of international rescue you are left to fight the fearsome fruits alone. Armed only with a laser gun, you must prevent the slaughter of thousands of innocent people. This gripping yarn is written in machine code with fast action and impressive graphics making the game extremely addictive.

SOFTWARE EXCHANGE

Sale! Cont.

CBM 08

COMMODORE

Puss 'n Boots
Program type: Arcade
Author: Gerard Duffy

The aim of this fast-action machine code program is to clear up your alley. In this sideways-scrolling game you are a cat with nine lives which are lost quickly as you are beset by rats, crows and local residents who hurl hobnailed boots at you.

Detective 64
Program type: Logic game
Author: Stephen Collins

This game is a version of *Electronic Detective.* A murder has been committed and you have to don your deerstalker and pick up a magnifying glass to deduce who is responsible for this crime. The game includes questioning, the ability to check suspects' fingerprints, and can be adapted for one player against the computer.

CBM 09

Brag
Program type: Simulation
Author: Lionel Jack

This is a simulation of the card game Three-card Brag. You control the hand and must beat the other three hands, all controlled by the computer.

Tug of War
Program type: Two-player Arcade
Author: Paul Randall

Unlike most computer games, this has you battling in a more friendly situation. In this two-player, keyboard-controlled game, each team must attempt to pull the other by pressing the appropriate key when the pull sign lights. The first to hit his key gains the advantage but if you are too quick the team will slip and fall.

CBM 10

Lightning Strike
Program type: Arcade
Author: John Taylor

This is a scramble-type game where attack helicopters must be guided through ever-decreasing caverns. Many of the routines are written in fast-action machine code, so the game is definitely fast. Missiles move up and down with the helicopter, so they can be guided to the target. The game is controlled by a joystick, with an unusual feature allowing the enemy 'copter to be transferred from the computer to an additional player.

Mini – Mon
Program type: Utility
Author: Simon Carter

Mini – Mon is a versatile code loader with routines for saving, loading, viewing, printing, entering and check-summing hexadecimal and decimal code. You can enter code in hex or decimal from any specified start address, with a variable number of bytes per line. For the machine code programmer, the utility can be used in place of virtually every other code loader and is useful as a monitor.

COMMODORE

CBM 11

Fast Food Laser

Program type: Shoot-'em-up
Author: Frank Tout

Set in a lonely burger bar in the depths of nowhere, a sole laser gun is engaged in battle with a selection of fearsome fast food. Because of a spillage of radioactive ketchup, normal food has been transformed into bloodthirsty monsters, no doubt getting their own back for an eternity of being eaten.

You control a laser gun near the cafe where the sadistic snacks are trapped. It is your task to save the world from destruction by preventing the enraged eats escaping.

Sorcerers' Quest

Program type: Text adventure
Author: Darryn Lavery

Playing the part of a fearless knight, you are sent on a near-impossible mission to destroy an evil sorcerer who has gone completely crazy and is wandering round the country casting wicked spells and leaving a trail of destruction in his path. To assist you in your fight you must find three magical objects – a cup, a sword and a shield.

As with most adventures, the inputs are entered in the verb-noun format. The vocabulary is by no means large but that does not detract from the enjoyment.

CBM 12

Super Wormy

Program type: Arcade
Author: Mikael Sundstrom

This is a version of the classic arcade *Snake* game. Suitable for two players, the game has nine level settings, with the object being to control the worm round the screen, collecting scattered food and taking great care not to double back on yourself.

Owzat

Program type: Simulation
Author: Mark Eastham

Based on the game of cricket, *Owzat* can be played by only two players. It follows closely the rules of cricket, with each player taking a turn to bat and bowl, being instructed to do so by a series of on-screen prompts. Rather than running between the wickets, the game calculates how far the ball has been hit and the likelihood of being caught or bowled. While the graphics are simple, the game does not suffer for that and remains extremely playable.

CBM 13

Splish Splash

Program type: Arcade
Author: Paul Greenstead

While watching some video nasties you have fallen asleep and wake to discover that your house has been flooded mysteriously. Luckily there happens to be an old rowing boat in the lounge. As the flood water rises you have to steer your vessel through the holes in the floor and to safety.

The game has 15 levels, each having a number of different nasties intent on preventing your escape.

The Mission

Program type: Shoot-'em-up
Author: Frank Tout

This game, not to be confused with the Roland Joffe film, is a classic arcade-type shoot-'em-up. After a routine flight you are ordered back to base as there has been an alien invasion. Your flight back to base proves to be a mission in itself, with numerous aliens attacking your lone craft.

The one advantage you have is unlimited fire power. Points are scored by destroying the aliens and the pods found littered about the landscape. There are four sections, with each scrolling over six screens, so there is plenty of action. The game is a turbo-loader.

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MINER MAN

◆ *Amstrad CPC* ● *Christopher Wilson*

As the name suggests, this game for the Amstrad CPC range is a version of the now classic arcade game *Manic Miner.* The object of the game is straightforward. The miner's task is to collect gold coins found scattered round each cavern. All of the coins are necessary to gain access to the next level, so each must be collected if the game is to continue.

While that sounds very easy, matters are complicated by the presence of 'X – Itrons' which, if touched by the miner, cause instant death.

An added feature to complicate the miner's task is a time limit set at the start of each level. If it expires the game ends and you return to the title screen.

```
9 LIST#8
10 UPC=27:DOC=34:LEC=69:RIC=67
20 DIM KPR$(79)
30 RESTORE 4120:FOR A=0 TO 79:READ KPR$(A):
NEXT A
40 DIM his$(10):DIM hic(10)
50 FOR a=0 TO 10:his$(a)="OFTSOFT":hic(a)=1
0000:NEXT a:a=0
60 INK 1,26:INK 2,3:INK 3,24
70 MODE 1:DIM A(16,11)
80 KEY 128,"MODE 2:LIST":SC=0:TI=200:L=1:v=
0:w=0:INK 1,26:INK 0,0:BORDER 0
90 RESTORE
100 C$=CHR$(154)+CHR$(155):D$=CHR$(156)+CHR
$(157)
110 E$=CHR$(158)+CHR$(159):F$=CHR$(160)+CHR
$(161)
120 K$=CHR$(170)+CHR$(171):L$=CHR$(172)+CHR
$(173)
130 G$=CHR$(162)+CHR$(163):H$=CHR$(164)+CHR
$(165)
140 I$=CHR$(166)+CHR$(167):J$=CHR$(168)+CHR
$(169)
150 za$=CHR$(174)+CHR$(175):zb$=CHR$(176)+C
HR$(177):zc$=CHR$(178)+CHR$(179)
160 zd$=CHR$(180)+CHR$(181):ze$=CHR$(182)+C
HR$(183):zf$=CHR$(186)+CHR$(187)
170 zg$=CHR$(184)+CHR$(185)
180 SYMBOL AFTER 149
190 SYMBOL 152,63,63,63,63,15,28,28,60:SYMB
OL 153,252,252,252,252,240,56,56,60
200 SYMBOL 154,7,15,31,63,127,236,237,237:S
YMBOL 155,224,240,248,252,254,99,107,107
210 SYMBOL 156,237,237,236,127,63,31,15,7:S
YMBOL 157,107,107,99,254,252,248,240,224
220 SYMBOL 158,0,48,0,64,4,0,0,97:SYMBOL 15
9,0,0,48,2,0,16,0,0
230 SYMBOL 160,0,0,24,0,4,0,33,0:SYMBOL 161
,0,48,0,4,32,0,194,0
240 SYMBOL 162,0,0,63,39,35,49,56,60:SYMBOL
 163,0,0,252,228,196,140,28,60
250 SYMBOL 164,60,56,49,35,39,63,0,0:SYMBOL
 165,60,28,140,196,228,252,0,0
260 SYMBOL 166,255,135,255,252,255,135,255,
252:SYMBOL 167,255,225,255,63,255,225,255,6
3
270 SYMBOL 168,255,135,255,252,255,135,255,
252:SYMBOL 169,255,225,255,63,255,225,255,6
3
280 SYMBOL 170,0,4,4,2,98,24,6,0:SYMBOL 171
,0,64,64,128,134,24,96,0:SYMBOL 172,0,6,24,
98,2,4,4,0:SYMBOL 173,0,96,24,134,128,64,64
,0
290 SYMBOL 174,1,2,15,7,7,7,3,0:SYMBOL 175,
128,192,240,224,176,224,192,0
300 SYMBOL 176,15,31,31,31,15,0,6,7:SYMBOL
177,240,248,248,248,240,0,48,56
310 SYMBOL 178,1,3,15,7,13,7,3,0:SYMBOL 179
,128,192,240,224,224,224,192,0
320 SYMBOL 180,15,31,31,31,15,0,6,14:SYMBOL
 181,240,248,248,248,240,0,48,112
330 SYMBOL 182,1,3,15,7,5,7,3,0:SYMBOL 183,
128,192,240,224,160,224,192,0
340 SYMBOL 184,15,31,31,31,15,0,6,6:SYMBOL
185,240,248,248,248,240,0,96,96
350 SYMBOL 186,1,3,15,7,7,7,3,0:SYMBOL 187,
128,192,240,224,224,224,192,0
360 IF gr=1 THEN INK 1,0
370 GOTO 3500
380 REM *** main loop ***
390 GOTO 480
400 x=1:y=11
410 IF con=0 THEN GOTO 920
420 IF CON=1 THEN GOTO 980
430 IF v=w THEN GOTO 1070
440 IF TI<=0 THEN CLS:GOTO 3770
450 LOCATE 3,25:PRINT" SCORE:";sc:LOCATE 30
,25:PRINT"TIME:";TI
460 TI=TI-1
470 GOTO 410
480 REM  ****  D R A W   S C R E E N S
***
490 INK 1,26:INK 2,3:INK 3,24
500 WINDOW 6,37,2,23:CLS:WINDOW 1,40,1,25:L
OCATE 16,20:PRINT"L E V E L  ";L
510 READ w:IF w=200 THEN 4260
520 FOR y%=1 TO 11
530 FOR x%=1 TO 16:READ a(x%,Y%)
540 IF a(X%,Y%)=0 THEN LOCATE (x%*2)+4,y%*2
:PEN 1:PRINT e$:LOCATE (x%*2)+4,(y%*2)+1:PR
INT F$
550 IF a(X%,Y%)=1 THEN LOCATE (x%*2)+4,y%*2
:PEN 2:PRINT G$:LOCATE (x%*2)+4,(y%*2)+1:PR
INT H$
560 IF a(X%,Y%)=2 THEN LOCATE (x%*2)+4,y%*2
:PEN 3:PRINT C$:LOCATE (x%*2)+4,(y%*2)+1:PR
INT D$
570 IF a(X%,Y%)=5 THEN LOCATE (x%*2)+4,y%*2
:PRINT I$:LOCATE (x%*2)+4,(y%*2)+1:PRINT J$
580 PEN 1
590 SOUND 1,(19-x%)*10-(2*y%),1
600 NEXT x%
610 NEXT y%
620 x=1:y=11:LOCATE (x*2)+4,y*2:PRINT za$:L
OCATE (x*2)+4,(y*2)+1:PRINT zb$:SOUND 3,50,
25,12,0,0,1:FOR axd=0 TO 100:NEXT axd
630 GOTO 400
640 REM *** check right ***
650 IF x=16 THEN GOTO 410
660 IF a(x+1,y)=1 THEN GOTO 1080
670 IF a(x+1,y)=0 THEN LOCATE (x*2)+4,y*2:P
RINT"  ":LOCATE (x*2)+4,(y*2)+1:PRINT"  ":x
=x+1:LOCATE (x*2)+4,y*2:PRINT za$:LOCATE (x
*2)+4,(y*2)+1:PRINT zb$:GOSUB 4150:GOTO 410

680 IF a(x+1,y)=2 THEN sc=sc+100:v=v+1:GOSU
B 1050:LOCATE (x*2)+4,y*2:PRINT"  ":LOCATE
(x*2)+4,(y*2)+1:PRINT"  ":A(X+1,Y)=3:x=x+1:
LOCATE (x*2)+4,y*2:PRINT za$:LOCATE (x*2)+4
,(y*2)+1:PRINT zb$:LOCATE 3,25:PRINT" SCORE
:";SC:GOTO 410
690 IF a(x+1,y)=3 THEN LOCATE (x*2)+4,y*2:P
RINT"  ":LOCATE (x*2)+4,(y*2)+1:PRINT"  ":x
=x+1:LOCATE (x*2)+4,y*2:PRINT za$:LOCATE (x
*2)+4,(y*2)+1:PRINT zb$:GOSUB 4150:GOTO 410
700 IF a(x+1,y)=5 THEN GOTO 410
710 REM *** check left ***
720 IF x=1 THEN GOTO 410
730 IF a(x-1,y)=1 THEN GOTO 1080
740 IF a(x-1,y)=0 THEN LOCATE (x*2)+4,y*2:P
RINT"  ":LOCATE (x*2)+4,(y*2)+1:PRINT"  ":x
=x-1:LOCATE (x*2)+4,y*2:PRINT zc$:LOCATE (x
*2)+4,(y*2)+1:PRINT zd$:GOSUB 4150:GOTO 410

750 IF a(x-1,y)=2 THEN sc=sc+100:v=v+1:GOSU
B 1050:LOCATE (x*2)+4,y*2:PRINT"  ":LOCATE
(x*2)+4,(y*2)+1:PRINT"  ":A(X-1,Y)=3:x=x-1:
LOCATE (x*2)+4,y*2:PRINT zc$:LOCATE (x*2)+4
,(y*2)+1:PRINT zd$:LOCATE 3,25:PRINT" SCORE
:";SC:GOTO 410
760 IF a(x-1,y)=3 THEN LOCATE (x*2)+4,y*2:P
RINT"  ":LOCATE (x*2)+4,(y*2)+1:PRINT"  ":x
=x-1:LOCATE (x*2)+4,y*2:PRINT zc$:LOCATE (x
*2)+4,(y*2)+1:PRINT zd$:GOSUB 4150:GOTO 410
770 IF a(x-1,y)=5 THEN GOTO 410
780 REM *** check down ***
790 IF y=11 THEN GOTO 410
800 IF a(x,y+1)=1 THEN GOTO 1080
810 IF a(x,y+1)=0 THEN LOCATE (x*2)+4,y*2:P
RINT"  ":LOCATE (x*2)+4,(y*2)+1:PRINT"  ":y
=y+1:LOCATE (x*2)+4,y*2:PRINT ze$:LOCATE (x
*2)+4,(y*2)+1:PRINT zg$:GOSUB 4150:GOTO 410

820 IF a(x,y+1)=2 THEN sc=sc+100:v=v+1:GOSU
B 1050:LOCATE (x*2)+4,y*2:PRINT"  ":LOCATE
(x*2)+4,(y*2)+1:PRINT"  ":A(X,Y+1)=3:y=y+1:
LOCATE (x*2)+4,y*2:PRINT ze$:LOCATE (x*2)+4
,(y*2)+1:PRINT zg$:LOCATE 3,25:PRINT" SCORE
:";SC:GOTO 410
830 IF a(x,y+1)=3 THEN LOCATE (x*2)+4,y*2:P
RINT"  ":LOCATE (x*2)+4,(y*2)+1:PRINT"  ":y
=y+1:LOCATE (x*2)+4,y*2:PRINT ze$:LOCATE (x
*2)+4,(y*2)+1:PRINT zg$:GOSUB 4150:GOTO 410
840 IF a(x,y+1)=5 THEN GOTO 410
850 REM *** check up ***
860 IF y=1 THEN GOTO 410
870 IF a(x,y-1)=1 THEN GOTO 1080
880 IF a(x,y-1)=0 THEN LOCATE (x*2)+4,y*2:P
RINT"  ":LOCATE (x*2)+4,(y*2)+1:PRINT"  ":y
=y-1:LOCATE (x*2)+4,y*2:PRINT zf$:LOCATE (x
*2)+4,(y*2)+1:PRINT zg$:GOSUB 4150:GOTO 410
890 IF a(x,y-1)=2 THEN sc=sc+100:v=v+1:GOSU
B 1050:LOCATE (x*2)+4,y*2:PRINT"  ":LOCATE
(x*2)+4,(y*2)+1:PRINT"  ":A(X,Y-1)=3:y=y-1:
LOCATE (x*2)+4,y*2:PRINT zf$:LOCATE (x*2)+4
,(y*2)+1:PRINT zg$:LOCATE 3,25:PRINT" SCORE
:";SC:GOTO 410
900 IF a(x,y-1)=3 THEN LOCATE (x*2)+4,y*2:P
RINT"  ":LOCATE (x*2)+4,(y*2)+1:PRINT"  ":y
```

```
*y-1:LOCATE (x*2)+4,y*2:PRINT z$:LOCATE (x
*2)+4,(y*2)+1:PRINT zg$:GOSUB 4150:GOTO 410
910 IF a(x,y-1)=5 THEN GOTO 410
920 REM ***  KEYBOARD  ***
930 IF INKEY(UPC)=0 THEN GOTO 640
940 IF INKEY(DOC)=0 THEN GOTO 710
950 IF INKEY(LEC)=0 THEN GOTO 780
960 IF INKEY(RIC)=0 THEN GOTO 850
970 GOTO 430
980 REM ***  JOYSTICK  ***
990 IF JOY(0) AND 8 THEN GOTO 640
1000 IF JOY(0) AND 4 THEN GOTO 710
1010 IF JOY(0) AND 2 THEN GOTO 780
1020 IF JOY(0) AND 1 THEN GOTO 850
1030 GOTO 430
1040 FOR a=26 TO 0 STEP -1:FOR z=0 TO 50:NE
XT z:INK 1,a:NEXT a:GOTO 3870
1050 FOR A=70 TO 50 STEP -10:SOUND 1,A,1,7:
NEXT
1060 RETURN
1070 U=0:FOR A%=TI TO 0 STEP -4:SOUND 1,50,
1:LOCATE 30,25:PRINT"TIME: ";A%:LOCATE 3,25:
PRINT" SCORE: ";SC:SC=SC+4:NEXT A%:L=L+1:TI=
200:GOTO 480
1080 LOCATE (X*2)+4,Y*2:PRINT K$:LOCATE (X*
2)+4,(Y*2)+1:PRINT L$:FOR XX=50 TO 200 STEP
 2:SOUND 1,XX,1,10:NEXT XX
1090 MODE 0:INK 1,26:GOTO 3770
1100 MODE 0:INK 1,26:LOCATE 6,12:PRINT"PLAY
ER 1"
1110 SOUND 1,261,40:SOUND 1,0,1:SOUND 1,246
,20:SOUND 1,0,1:SOUND 1,220,40:SOUND 1,0,1:
SOUND 1,261,40:SOUND 1,0,1:SOUND 1,174,80
1120 RESTORE:sc=0:l=1:ti=200:x=1:y=11
1130 FOR A=0 TO 2000:NEXT A
1140 FOR A=0 TO 15:PRINT:NEXT A
1150 MODE 1
1160 FOR N=1 TO 24 STEP 2:LOCATE 4,N:PRINT
I$::LOCATE 4,N+1:PRINT J$:NEXT N
1170 FOR N=1 TO 24 STEP 2:LOCATE 38,N:PRINT
 I$::LOCATE 38,N+1:PRINT J$:NEXT N
1180 FOR M=4 TO 39 STEP 2:LOCATE M,1:PRINT
I$:NEXT M
1190 FOR M=4 TO 39 STEP 2:LOCATE M,24:PRINT
 I$:NEXT M
1200 GOTO 380
1210 REM  ***  SCREEN 1  ***
1220 DATA 13,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,
0
1230 DATA 2,0,0,0,0,1,0,0,0,0,1,1,1,0,0,1
1240 DATA 0,0,0,0,0,0,0,0,0,0,1,1,1,0,0,0
1250 DATA 0,0,0,0,0,0,0,0,0,0,0,0,2,2,0,0
1260 DATA 0,0,0,0,0,0,1,1,0,0,0,0,0,0,0,0
1270 DATA 0,1,0,0,0,0,0,0,1,0,0,0,0,0,0,0
1280 DATA 0,0,0,0,1,0,2,2,2,0,0,0,0,0,0,0
1290 DATA 0,0,0,0,1,0,0,0,0,0,0,0,2,2,0,0
1300 DATA 0,0,0,2,0,0,0,0,0,0,0,0,0,0,0,0
1310 DATA 0,1,0,2,2,0,0,0,0,0,0,0,1,1,1,0
1320 DATA 0,0,0,0,0,0,0,0,2,0,0,0,0,0,2,0
1330 REM  ***  SCREEN 2  ***
1340 DATA 26,2,2,0,0,0,1,1,1,1,1,1,0,0,2,2,
2
1350 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,2,2,2
1360 DATA 0,0,1,1,0,2,2,2,2,2,0,0,0,0,0,0
1370 DATA 0,0,0,0,0,5,5,5,5,5,5,0,0,0,0,0
1380 DATA 0,0,0,0,0,0,2,2,1,1,1,0,0,1,1,0
1390 DATA 0,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0
1400 DATA 0,2,2,2,0,0,0,0,2,2,2,0,0,0,0,0
1410 DATA 0,0,0,0,2,0,0,0,0,0,0,5,5,5,5,5
1420 DATA 0,0,0,0,0,0,0,0,0,0,1,1,1,0,0,0
1430 DATA 5,5,5,5,5,0,0,2,0,0,0,0,1,1,1,0
1440 DATA 0,0,2,0,2,0,0,0,0,0,0,0,2,0,0,0
1450 REM  ***  SCREEN 3  ***
1460 DATA 20,1,1,2,0,1,0,0,1,2,0,0,0,5,2,1,
2
1470 DATA 0,0,0,0,0,0,0,0,0,0,0,0,5,0,1,0
1480 DATA 0,0,0,0,0,0,0,0,0,0,0,0,5,0,0,0
1490 DATA 2,0,0,5,5,5,5,0,5,5,5,5,5,0,0,0
1500 DATA 0,0,0,5,1,1,1,0,1,1,1,1,5,0,0,2
1510 DATA 0,0,0,5,0,0,2,0,0,0,0,0,5,0,0,0
1520 DATA 0,0,0,5,2,2,2,0,2,2,2,2,5,0,0,0
1530 DATA 0,1,0,5,0,0,2,0,0,0,2,0,5,2,0,0
1540 DATA 0,0,0,5,5,5,5,5,5,5,5,5,5,0,0,0
1550 DATA 0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0
1560 DATA 0,2,0,2,0,0,0,0,0,0,2,0,0,0,0,0
1570 REM  ***  SCREEN 4  ***
1580 DATA 28,2,1,5,0,1,2,2,1,5,0,1,0,1,0,5,
2
1590 DATA 0,0,5,0,0,0,2,0,5,0,0,0,0,0,5,2
1600 DATA 1,2,5,0,2,5,0,0,5,2,0,5,0,2,5,2
1610 DATA 0,0,5,0,0,5,2,0,5,0,0,5,0,0,5,0
1620 DATA 2,1,5,1,0,5,0,0,5,0,1,5,1,0,5,2
1630 DATA 0,0,5,0,0,5,0,1,5,0,0,5,0,0,5,0
1640 DATA 0,0,5,0,2,5,0,0,5,2,0,5,0,2,5,0
1650 DATA 1,2,5,0,0,5,0,0,5,0,0,5,0,0,5,2
1660 DATA 0,0,5,1,0,5,2,0,5,0,1,5,0,0,5,0
1670 DATA 0,2,0,0,0,5,0,0,0,0,0,5,1,0,5,0
1680 DATA 0,2,0,0,2,5,0,2,0,2,0,5,0,2,2,2
1690 REM  ***  SCREEN 5  ***
1700 DATA 27,1,1,0,0,0,2,0,0,2,0,0,2,0,0,1,
2
1710 DATA 0,0,2,5,5,5,5,5,5,5,5,5,5,0,0,0
1720 DATA 2,0,5,5,5,5,5,5,5,5,5,5,5,5,0,2
1730 DATA 0,5,5,5,5,5,5,5,5,5,5,5,5,5,5,0
1740 DATA 0,2,5,1,0,0,0,0,0,1,1,1,1,5,0,0
1750 DATA 0,0,5,0,1,0,2,5,0,0,0,0,2,5,0,2
1760 DATA 0,0,5,2,2,0,0,5,0,2,2,2,0,5,1,0
1770 DATA 1,0,5,5,5,5,5,5,0,0,0,0,0,5,0,0
1780 DATA 0,0,5,1,1,1,1,5,0,0,0,0,2,5,0,2
1790 DATA 0,2,5,0,0,0,0,0,0,0,0,2,0,5,0,0
1800 DATA 0,0,5,2,2,2,2,5,0,2,2,0,0,2,0,1
1810 REM  ***  SCREEN 6  ***
1820 DATA 34,2,0,0,0,1,1,1,5,5,1,1,1,0,0,0,2
1830 DATA 0,2,2,0,0,0,1,5,5,1,0,0,0,2,2,0
1840 DATA 0,0,0,2,2,0,0,5,5,0,0,2,2,0,0,0
1850 DATA 1,1,0,0,0,2,2,5,5,2,2,0,0,0,1,1
1860 DATA 1,1,1,1,0,0,0,2,2,0,0,0,1,1,1,1
1870 DATA 5,5,5,5,5,5,5,2,2,5,5,5,5,5,5,5
1880 DATA 1,1,1,1,0,0,0,2,2,0,0,0,1,1,1,1
1890 DATA 1,1,0,0,0,2,2,5,5,2,2,0,0,0,1,1
1900 DATA 0,0,0,2,2,0,0,5,5,0,0,2,2,0,0,0
1910 DATA 0,2,2,0,0,0,1,5,5,1,0,0,0,2,2,0
1920 DATA 0,2,0,0,1,1,1,5,5,1,1,1,0,0,0,2
1930 REM  ***  SCREEN 7  ***
1940 DATA 34,2,0,0,2,5,2,0,0,2,5,2,0,0,2,5,
2
1950 DATA 0,1,1,0,5,0,1,1,0,5,0,1,1,0,5,0
1960 DATA 2,0,0,2,5,2,0,0,2,5,2,0,0,2,5,0
1970 DATA 5,5,5,0,5,0,5,5,0,5,0,5,5,0,5,0
1980 DATA 2,0,0,2,0,2,0,0,2,0,2,0,0,2,0,0
1990 DATA 0,1,1,0,5,0,1,1,0,5,0,1,1,0,5,2
2000 DATA 2,0,0,2,0,2,0,0,2,0,2,0,0,2,5,0
2010 DATA 5,5,5,5,5,5,5,5,5,5,5,5,5,5,5,0
2020 DATA 1,2,1,2,0,0,1,2,0,0,1,2,0,0,5,0
2030 DATA 1,0,1,0,1,0,1,0,1,0,1,0,1,0,5,0
2040 DATA 0,0,0,0,1,2,0,0,1,2,0,0,1,2,0,2
2050 REM  ***  SCREEN 8  ***
2060 DATA 29,2,0,1,0,2,0,0,2,0,0,2,0,0,2,0,
1
2070 DATA 1,0,1,0,1,1,1,1,0,1,1,1,1,1,0,1
2080 DATA 1,0,2,0,1,2,2,2,2,2,2,2,2,1,0,0
2090 DATA 5,5,5,5,5,5,5,5,5,5,5,5,5,5,5,0
2100 DATA 1,0,0,0,1,2,0,0,1,2,0,0,1,2,0,2
2110 DATA 0,0,1,2,0,0,1,2,0,0,1,2,0,0,1,1
2120 DATA 0,5,5,5,5,5,5,5,5,5,5,5,5,5,5,5
2130 DATA 2,0,0,1,0,0,0,1,0,0,0,1,0,0,0,1
2140 DATA 1,1,0,0,2,1,0,0,2,1,0,0,2,1,0,0
2150 DATA 5,5,5,5,5,5,5,5,5,5,5,5,5,5,5,0
2160 DATA 0,0,2,0,0,0,0,2,0,0,0,0,2,0,0,2
2170 REM  ***  SCREEN 9  ***
2180 DATA 23,2,0,5,2,2,5,0,2,5,2,0,5,2,0,2,
5
2190 DATA 0,1,5,1,0,5,0,1,5,1,0,5,0,1,0,5
2200 DATA 0,0,5,0,0,5,0,0,5,0,2,5,0,1,0,5
2210 DATA 2,0,5,0,0,5,1,0,5,0,1,5,0,1,0,5
2220 DATA 1,0,5,2,1,5,0,2,5,0,0,5,0,1,0,5
2230 DATA 0,2,5,0,0,5,0,1,5,1,0,5,0,1,2,5
2240 DATA 0,1,5,0,0,5,0,0,5,2,0,5,2,1,0,5
2250 DATA 0,1,5,1,0,5,1,0,5,0,1,5,5,1,0,5
2260 DATA 0,0,2,0,0,2,0,0,2,0,0,2,0,0,0,0
2270 DATA 5,5,5,5,5,5,5,5,5,5,5,5,5,5,5,0
2280 DATA 0,0,0,2,0,0,0,2,0,0,0,2,0,0,0,2
2290 REM  ***  SCREEN 10  ***
2300 DATA 26,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1,
0
2310 DATA 1,0,0,0,2,0,0,0,2,0,0,0,2,0,0,1
2320 DATA 1,0,0,0,1,0,0,0,1,0,0,0,1,0,0,1
2330 DATA 1,2,0,0,1,2,0,0,1,2,0,0,1,2,0,1
2340 DATA 1,1,1,1,1,1,1,1,1,1,1,1,1,1,0,2
2350 DATA 1,0,0,0,2,0,0,0,2,0,0,0,2,0,0,2
2360 DATA 1,2,0,0,1,2,0,0,1,2,0,0,1,2,0,2
2370 DATA 1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,2
2380 DATA 1,0,0,2,0,0,0,0,0,0,0,0,0,2,0,0
2390 DATA 1,1,2,1,2,1,1,1,1,1,1,1,2,1,2,1
2400 DATA 0,0,0,2,0,0,0,0,0,0,0,0,0,2,0,0
2410 REM  ***  SCREEN 11  **
2420 DATA 128,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2
,2
2430 DATA 2,5,2,2,2,2,2,2,2,2,2,2,2,5,5,5
2440 DATA 2,5,2,2,2,2,2,2,2,2,2,2,2,5,0,0
2450 DATA 2,5,5,5,2,2,2,5,5,5,2,2,2,5,5,5
2460 DATA 2,5,0,5,2,2,2,5,2,5,2,2,2,2,2,5
2470 DATA 2,5,5,5,2,2,2,5,2,5,2,2,2,5,5,5
2480 DATA 2,2,2,2,5,5,5,2,2,2,5,2,5,2,2,2
2490 DATA 2,2,2,2,5,0,5,2,2,2,5,2,5,2,2,2
2500 DATA 2,2,2,2,5,5,5,2,2,2,5,5,5,2,2,2
2510 DATA 2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2
2520 DATA 0,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2
2530 REM  *** SCREEN 12 ***
2540 DATA 18,2,0,0,0,2,0,0,2,0,0,2,0,2,0,0,
2
2550 DATA 0,5,5,5,5,5,5,1,0,5,5,5,5,5,5,0
2560 DATA 0,0,0,0,0,5,5,1,2,5,5,5,5,5,5,0
2570 DATA 0,5,5,2,1,5,5,0,0,5,5,2,0,0,2,0
2580 DATA 0,5,5,0,0,5,5,1,0,5,5,5,5,5,5,0
2590 DATA 0,5,5,1,2,5,5,0,0,0,0,0,2,5,5,0
2600 DATA 2,5,5,0,0,5,5,0,1,0,0,0,0,5,5,0
2610 DATA 0,5,5,2,1,5,5,0,1,0,2,0,1,5,5,2
2620 DATA 0,5,5,5,5,5,5,2,0,5,5,5,5,5,5,0
2630 DATA 1,5,5,5,5,5,5,1,0,5,5,5,5,5,5,0
2640 DATA 0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,2
2650 REM  ***  SCREEN 13  ***
2660 DATA 1,0,0,0,0,1,0,0,0,0,0,0,0,0,1,1,1
2670 DATA 0,1,1,0,5,5,0,5,5,5,5,5,0,0,0,1
2680 DATA 0,0,1,0,5,5,0,5,5,5,5,5,1,1,0,0
2690 DATA 1,0,1,0,5,5,0,0,0,0,5,5,1,1,1,0
2700 DATA 0,0,1,0,5,5,0,5,5,5,5,5,0,0,0,0
2710 DATA 0,1,1,0,5,5,0,5,5,5,5,5,0,1,0,0
2720 DATA 0,0,1,0,5,5,0,0,0,2,5,5,0,1,1,1
2730 DATA 1,0,1,0,5,5,0,5,5,5,5,5,0,0,0,0
2740 DATA 0,0,1,0,5,5,0,5,5,5,5,5,1,1,1,0
2750 DATA 0,1,0,0,0,1,1,0,0,0,1,0,0,0,1,0
2750 DATA 0,1,0,0,0,1,1,0,0,0,1,0,0,0,1,0
2760 DATA 0,1,1,1,0,0,0,0,1,0,0,0,1,0,0,0
2770 REM *** SCREEN 14  ***
2780 DATA 45,2,0,0,0,2,0,0,0,2,0,0,0,2,0,0,2
2790 DATA 0,1,1,5,5,5,5,5,5,5,5,5,5,2,5,0
2800 DATA 2,1,1,5,2,0,2,0,2,0,2,0,1,2,5,0
2810 DATA 2,0,2,5,1,2,1,2,1,2,1,2,2,2,5,2
2820 DATA 1,2,1,5,2,2,2,0,2,0,2,0,1,2,5,0
2830 DATA 2,0,0,5,5,5,5,5,5,5,5,5,5,2,5,0
2840 DATA 0,5,5,5,5,5,5,5,5,5,5,5,5,2,5,2
2850 DATA 0,5,2,1,2,0,2,0,2,1,2,0,2,0,5,0
2860 DATA 0,5,0,1,0,1,0,1,0,1,0,1,0,1,5,0
2870 DATA 0,5,2,0,2,1,2,1,2,0,2,1,2,1,5,2
2880 DATA 0,5,5,5,5,5,5,5,5,5,5,5,5,5,5,0
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```
2890 REM  ***  SCREEN 15  ***
2900 DATA 36,2,1,1,1,2,0,0,0,0,0,0,1,2,0,0,
2
2910 DATA 0,0,0,0,1,0,1,1,1,1,0,1,2,1,1,1
2920 DATA 0,1,1,2,1,0,1,1,0,2,0,1,2,0,2,1
2930 DATA 0,1,0,0,1,2,0,1,0,1,1,1,1,1,0,1
2940 DATA 0,1,0,1,1,1,0,1,0,1,2,2,2,1,0,1
2950 DATA 0,1,0,1,0,0,0,1,2,0,2,2,2,1,0,1
2960 DATA 2,1,2,1,2,1,0,1,0,1,2,2,2,1,0,1
2970 DATA 0,1,0,1,2,1,0,1,0,1,1,1,1,1,0,1
2980 DATA 0,1,0,1,2,1,0,1,2,1,0,0,0,0,2,1
2990 DATA 0,1,0,1,1,1,0,1,0,0,2,1,2,1,1,1
3000 DATA 0,1,2,0,0,0,2,1,2,1,1,1,2,2,2,2
3010 REM *** SCREEN 16 ***
3020 DATA 10,1,0,0,0,0,0,0,0,1,2,0,1,1,1,1,
1
3030 DATA 0,0,1,0,1,0,1,0,0,1,0,0,0,0,0,0
3040 DATA 2,1,0,0,1,0,0,1,0,1,1,1,1,1,1,0
3050 DATA 1,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0
3060 DATA 0,0,1,0,0,1,0,1,0,1,1,1,1,1,1,1
3070 DATA 2,1,0,0,1,0,0,1,0,1,1,1,0,2,1,2
3080 DATA 1,0,0,1,0,0,1,0,0,1,1,0,0,1,0,0
3090 DATA 0,0,1,0,0,1,0,0,1,1,0,0,1,0,0,1
3100 DATA 2,1,0,0,1,0,0,1,2,0,0,1,0,0,1,2
3110 DATA 1,0,2,1,0,0,1,1,0,0,1,1,0,1,0,0
3120 DATA 0,0,1,2,0,0,0,0,0,0,0,0,0,0,0,0
3130 REM *** screen 17 ***
3140 DATA 24,2,0,2,0,2,0,2,0,2,0,2,0,2,0,2,0
3150 DATA 0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1
3160 DATA 2,0,2,0,2,0,2,0,2,0,2,0,2,0,2,0
3170 DATA 0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1
3180 DATA 2,0,2,0,2,0,2,0,2,0,2,0,2,0,2,0
3190 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3200 DATA 0,5,0,5,0,5,0,5,0,5,0,5,0,5,0,5
3210 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3220 DATA 1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,0
3230 DATA 0,0,0,1,0,0,0,1,0,0,0,1,0,0,0,0
3240 DATA 0,1,0,0,0,1,0,0,0,1,0,0,0,1,0,0
3250 REM *** SCREEN 18 ***
3260 DATA 41,2,0,2,0,2,0,2,0,2,0,2,0,2,0,2,0
3270 DATA 0,0,0,1,1,0,0,0,0,1,1,0,0,0,0,0
3280 DATA 2,0,1,1,1,0,2,0,2,1,1,1,1,0,2,0
3290 DATA 0,0,0,1,1,0,0,0,1,1,0,0,1,1,0,0
3300 DATA 2,0,2,1,1,0,2,0,2,1,1,1,1,0,2,0
3310 DATA 0,0,0,1,1,0,0,0,0,1,1,1,1,0,0,0
3320 DATA 2,0,2,1,1,0,2,0,1,1,0,0,1,1,0,2
3330 DATA 0,0,0,1,1,0,0,0,0,1,1,1,1,0,0,0
3340 DATA 2,0,1,1,1,1,0,2,0,2,1,1,0,2,0,2
3350 DATA 0,2,0,2,0,2,0,2,0,2,0,2,0,2,0,2
3360 DATA 0,0,2,0,2,0,2,0,2,0,2,0,2,0,2,0
3370 REM *** SCREEN 19 ***
3380 DATA 1,1,1,1,0,1,0,1,0,1,1,1,0,0,0,0,2
3390 DATA 0,1,0,0,1,0,1,0,1,0,0,0,0,0,0,0
3400 DATA 0,1,0,0,1,1,1,0,1,1,1,0,0,0,0,0
3410 DATA 0,1,0,0,1,0,1,0,1,0,0,0,0,0,0,0
3420 DATA 0,1,0,0,1,0,1,0,1,1,1,0,0,0,0,0
3430 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3440 DATA 0,0,0,0,0,1,1,1,0,1,0,1,0,1,1,0
3450 DATA 0,0,0,0,0,1,0,0,0,1,1,1,0,1,0,1
3460 DATA 0,0,0,0,0,1,1,1,0,1,1,1,0,1,0,1
3470 DATA 0,0,0,0,0,1,0,0,0,1,1,1,0,1,0,1
3480 DATA 0,0,0,0,0,1,1,1,0,1,0,1,0,1,1,0
3490 DATA 200
3500 REM **** Title Page ****
3510 MODE 1
3520 MOVE 150,300:DRAW 440,300:DRAW 440,322
:DRAW 150,322:DRAW 150,300
3530 MOVE 170,100:DRAW 500,100:DRAW 500,10:
DRAW 170,10:DRAW 170,100
3540 MOVE 1,1:DRAW 1,399:DRAW 639,399:DRAW
639,1:DRAW 1,1:MOVE 4,4:DRAW 4,395:DRAW 635
,395:DRAW 635,4:DRAW 4,4
3550 LOCATE 11,6:PRINT"M I N E R   M A N"
3560 LOCATE 6,16:PRINT" Author: Christopher
 Wilson"
3570 LOCATE 12,20:PRINT"  I - INSTRUCTIONS"
3580 LOCATE 12,21:PRINT"  C - SWOP KEYS"
3590 LOCATE 12,22:PRINT"  S - START   "
3600 LOCATE 12,23:PRINT"  J - JOYSTICK"
3610 LOCATE 12,24:PRINT"  k - KEYBOARD"
3620 FOR a-1 TO 19:LOCATE (a*2),10:PRINT za
$:LOCATE (a*2),11:PRINT zb$
3630 IF JOY(0) AND 16 THEN CON-1:GOTO 1100
3640 IF INKEY(35)-0 THEN 4160
3650 IF INKEY(62)-0 THEN 3880
3660 IF INKEY(60)-0 THEN 1100
3670 IF INKEY(37)-0 THEN CON-0
3680 IF INKEY(45)-0 THEN CON-1
3690 IF CON-0 THEN LOCATE 13,24:PRINT">":LO
CATE 13,23:PRINT" "
3700 IF CON-1 THEN LOCATE 13,23:PRINT">":LO
CATE 13,24:PRINT" "
3710 FOR Q-0 TO 100:NEXT Q
3720 LOCATE (a*2),10:PRINT"  ":LOCATE (a*2)
,11:PRINT"  "
3730 NEXT a
3740 GOTO 3620
3750 REM
3760 REM
3770 MODE 0
3780 MOVE 1,1:DRAW 639,1:DRAW 639,399:DRAW
1,399:DRAW 1,1
3790 LOCATE 6,8:PRINT"GAML  OVER"
3800 LOCATE 5,14:PRINT"SCORE:";SC
3810 SOUND 1,261,40:SOUND  ,0,1:SOUND 1,261
,10:SOUND 1,0,20:SOUND 1,261,10:SOUND 1,0,1
:SOUND 1,261,40:SOUND 1,0,1:SOUND 1,233,30:
SOUND 1,246,10:SOUND 1,0,1:SOUND 1,246,20:S
OUND 1,0,1:SOUND 1,261,20:SOUND 1,0,1:SOUND
 1,261,20
3820 SOUND 1,0,1:SOUND 1,277,20:SOUND 1,0,1
:SOUND 1,261,80
3830 FOR Z-0 TO 1000:NEXT
3840 PEN 2
3850 FOR q-0 TO 100:x-INT(RND*17)+2:y-INT(R
ND*22)+2:LOCATE x,y:PRINT za$:LOCATE x,y+1:
PRINT zb$:NEXT q
3860 PEN 1
3870 INK 1,26:MODE 1:v-0:w-0:sc-0:ti-200:l-
1:GOTO 3500
3880 MODE 0:INK 2,20
3890 PEN 2:LOCATE 5,2:PRINT"REDEFINE KEYS"
3900 PEN 1:LOCATE 5,6:PRINT" U ......."
3910 FOR a-0 TO 79:IF INKEY(a)-0 THEN RIC-a
:GOTO 3940
3920 NEXT a
3930 GOTO 3910
3940 LOCATE 15,6:PRINT KPR$(A)
3950 FOR QQ-0 TO 500:NEXT:SOUND 1,50,10:LOC
ATE 5,8:PRINT" D ......."
3960 LOCATE 15,6:PRINT KPR$(A)
3970 FOR a-0 TO 79:IF INKEY(a)-0 THEN LEC-a
:GOTO 4000
3980 NEXT A
3990 GOTO 3970
4000 LOCATE 15,8:PRINT KPR$(A)
4010 FOR QQ-0 TO 500:NEXT:SOUND 1,50,10:LOC
ATE 5,10:PRINT" L ......."
4020 FOR a-0 TO 79:IF INKEY(a)-0 THEN DOC-a
:GOTO 4050
4030 NEXT A
4040 GOTO 4020
4050 LOCATE 15,10:PRINT KPR$(A)
4060 FOR QQ-0 TO 500:NEXT:SOUND 1,50,10:LOC
ATE 5,12:PRINT" R ......."
4070 FOR a-0 TO 79:IF INKEY(a)-0 THEN UPC-a
:GOTO 4100
4080 NEXT A
4090 GOTO 4070
4100 LOCATE 15,12:PRINT KPR$(A)
4110 FOR qq-0 TO 500:NEXT:SOUND 1,50,10:INK
 2,3:GOTO 3500
4120 DATA CU,CR,CD,K9,K6,K3,KENT,K,CL,COPY,
K7,K8,K5,K1,K2,K0,CLR,"[",ENTER,"]",K4,SHIF
T,"\",CTRL,"^","-","@",P,";",":","/",".",0,
9,O,I
4130 DATA L,K,M,",",8,7,U,Y,H,J,N,SPACE,6,5
,R,T,G,F,B,V,4,3,E,W,S,D,C,X,1
4140 DATA 2,ESC,Q,TAB,A,CAPS,Z,JOU,JOD,JOL,
JOR,JOF2,JOF1,XXX,DEL
4150 SOUND 3,50,3,4,0,0,1:RETURN
4160 REM *** INSTRUCTIONS ***
4170 MODE 1
4180 PRINT" You,Fred,have been placed in th
e huge  mines of suburbitron,near the Fores
t of Endoria,by the evil neck-romancer.But
  things aren't so bad:the mines are "
4190 PRINT"littered with gold coins,but als
o with  the deadly X-itrons.You may only go
 on  to the next level if you have collecte
d all of the gold coins in that level."
4200 PRINT
4210 PRINT" The keys have been defined as :
       Q - up : A - down : O - left : P -
rightbut pressing J on the title page will
  enable you to use the joystick,and pres-s
ing C will enable you to redefine the  keys"
4220 LOCATE 1,23:PRINT"  Good luck on your
Quest,brave Fred!"
4230 LOCATE 16,25:PRINT"(SPACE)"
4240 IF INKEY(47)-0 THEN 3500
4250 GOTO 4240
4260 REM *** FINAL SCREEN ***
4270 MODE 0
4280 FOR q-1 TO 8:LOCATE q,12:PRINT za$:LOC
ATE q,13:PRINT zb$
4290 FOR v-0 TO 200:NEXT v
4300 LOCATE q,12:PRINT"  ":LOCATE q,13:PRIN
T"  ":NEXT q
4310 LOCATE q+1,12:PRINT za$:LOCATE q+1,13:
PRINT zg$
4320 LOCATE 5,5:PRINT"WELL DONE!"
4330 FOR v-0 TO 200:NEXT v
4340 LOCATE 2,23:PRINT"You have completed"
4350 LOCATE 5,25:PRINT"your quest"
4360 FOR s-1 TO 1000 STEP 10:SOUND 1,s,1:NEXT
4370 FOR v-0 TO 1000:NEXT v
4380 GOTO 2760
```

TEXT PATTERN

◆ *Spectrum 48K* ● *Dan Sandberg*

This program from a Swedish reader contains three utilities which make it easy to soft scroll the screen and fill areas with patterns. There are an enormous number of patterns to be created and there are more than 10,000 combinations written into the program. There is a text file in the program with full explanation of everything you need to know. The program also loads the user

graphics with the values for the Scandinavian characters which could prove to be more useful than the usual characters.

```
1000 CLS : BORDER 6: RESTORE 600
0: FOR F=1 TO 10: READ X$: PRINT
 AT 21,0;X$: GO SUB 9940: NEXT F
1010 FOR F=22528 TO 22911: POKE
F,48: NEXT F
1020 FOR F=1 TO 6: READ X$: PRIN
T AT 21,0;X$: GO SUB 9940: NEXT
F
1030 FOR F=1 TO 12: READ X$: PRI
NT AT 21,0; PAPER 4;X$: GO SUB 9
940: GO SUB 9960: NEXT F
1035 FOR F=1 TO 22: PAUSE 25: GO
 SUB 9960: NEXT F
1040 PAUSE 100: CLS : FOR F=1 TO
 10: READ X$: PRINT AT 21,0;X$:
GO SUB 9940: NEXT F: PAUSE 50
1050 LET MODUL2=0: LET MODUL1=1:

 FOR H=0 TO 2: PAUSE 100: CLS :
PLOT 80,0: DRAW 10,175: PLOT 180
,0: DRAW -15,175: PLOT 0,60: DRA
W 255,0: PLOT 0,124: DRAW 255,0
1060 FOR Y=50 TO 150 STEP 50: FO
R X=70 TO 210 STEP 70: GO SUB 99
00: LET MODUL1=MODUL1+2: NEXT X:
 NEXT Y: NEXT H
1070 LET R=6500: PAUSE 100: CLS
: FOR Y=42 TO 127 STEP 85: FOR X
=42 TO 250 STEP 85: CIRCLE X,Y,4
2: RESTORE R: READ MODUL1,MODUL2
: GO SUB 9900: LET R=R+1: NEXT X
: NEXT Y
1075 FOR F=0 TO 21: GO SUB 9930:
 NEXT F
1080 CLS : PRINT "While a solid
fill routine is"
1090 PRINT "easy to make fill ev
ery part of"
1100 PRINT "a picture, it is  uc
h harder"
1110 PRINT "with a pattern-fil.-
routine"
1120 PRINT "since you cant know
which pixels"
1130 PRINT "are already done. It
 can be done"
1140 PRINT "but would slow down
the routine"
1150 PRINT "considerably. So to
completely"
1160 PRINT "fill a complicated a
rea you may"
1170 PRINT "have to use more tha
n one start-"
1180 PRINT "ing point. In that c
ase, try to"
1190 PRINT "use the highest and
lowest"
1200 PRINT "points in the area."
1210 PRINT "To fill, use GOSUB 9
900 and let"
1220 PRINT "X and Y contain the
coordinats"

1230 PRINT "of the starting poin
t. You cho-"
1240 PRINT "ose one of 55 primar
y patterns"
1250 PRINT "by setting variable
MODUL1 to"
1260 PRINT "0-55 (0=OFF, no patt
ern) Another"
1270 PRINT "primary pattern is c
hoosed with"
1280 PRINT "MODUL2 and the two p
atterns are"
1290 PRINT "mixed together to wh
at you will"
1300 PRINT "see. The mixing can
be done with"
1310 PRINT "AND, OR or XOR speci
fied by POKE"
1320 PRINT "65367,(0-2) normaly
it is XOR."
1330 PRINT "A primary pattern wi
ll be turned"
1340 PRINT "90 degrees depending
 upon which"
1350 PRINT "MODULE you call it f
rom."
1360 PRINT "This gives you a tot
al of over"
1370 PRINT "18000 preprogrammed
patterns to"
1380 PRINT "choose from. When yo
u investi-"
1390 PRINT "gate the primary pat
terns set"
1400 PRINT "one MODUL to 0 so yo
u will not"
1410 PRINT "have two interfering
 patterns."
1420 PRINT "Now you know everyth
ing you need"
1430 PRINT "to know to use the r
outines but,"
1440 PRINT "since you might want
 to add your"
1450 PRINT "own primary patterns
 we will try"
1460 PRINT "to explain how. You
must know"
1470 PRINT "alittle about binary
 math to"

1480 PRINT "understand though. T
he data for"
1490 PRINT "the 55 primary patte
rns are sto-"
1500 PRINT "red in lines 9000-90
55. Each"
1510 PRINT "line contains six by
te paramet-"
1520 PRINT "ers which is what a
module needs"
1530 PRINT "to create a primary
pattern."
1540 PRINT "Here are the functio
ns and range"
1550 PRINT "of these six paramet
ers:"
1560 PRINT "1 - MASK value for X
   (0-255)"
1570 PRINT "2 - MASK value for Y
   (0-255)"
1580 PRINT "3 - MASKvalue for RE
SULT (0-255)"
1590 PRINT "4 - OPERATION (0-4)
(0=ADD,"
1600 PRINT "               1=SUB, 2
=AND, 3=XOR)"
1610 PRINT "5 - TEST (0-8) (0=CO
MPARE,"
1620 PRINT "            1=BIT1, 2=BIT
2,...8=BIT8)"
1630 PRINT "6 - COMPAREVALUE (0-
255 (Used"
1640 PRINT "       only together w
ith COMPARE)"
1643 PRINT "It can be easier to
use the BIN-"
1645 PRINT "function and a binar
y number"

1647 PRINT "rather than using de
cimal num-"
1650 PRINT "bers. This is what a
 module does"
1660 PRINT "The X and Y values o
f the pixel"
1670 PRINT "are masked (logical
AND opera-"
1680 PRINT "tion) with the MASKv
alues. They"
1690 PRINT "are then brought tog
ether by the"
1700 PRINT "specified OPERATION
and the re-"
1710 PRINT "sult is masked. The
masked re-"
1720 PRINT "sult is then TESTED.
 In the BIT-"
1730 PRINT "case the PLOTFLAG of
 that module"
1740 PRINT "is set if the specif
ied bit hap-"
1750 PRINT "pens to be 1. In the
 case of"
1760 PRINT "COMPARE the PLOTFLAG
 is set if"
1770 PRINT "the result is less t
han the"
1780 PRINT "COMPAREVALUE. The PL
OTFLAGS of"
1790 PRINT "the both modules are
 then"
1800 PRINT "brought together by
AND, OR or"
1810 PRINT "XOR thus mixing two
primary"
1820 PRINT "patterns together. N
ow, using"
1830 PRINT "only one modul (set
the other to"
1840 PRINT "0) say that you want
 to create"
1850 PRINT "a diagonal line over
 the screen"
1860 PRINT "The ekvation is of c
ause y=x"
1870 PRINT "Here you should see
it as x-y=0"
```


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```
1880 PRINT "Set MASKs to 255 (BI
N 11111111)"
1885 PRINT "so that the variable
s will not"
1890 PRINT "be affected. Select
(-) by OPER-"
1900 PRINT "ATION (=1). TEST for
 0 with"
1910 PRINT "COMPARE and COMPAREV
ALUE=1"
1920 PRINT "(only 0 is less than
 1 here)."
1930 PRINT "That is all."
1940 PRINT "A single diagonal li
ne is hardly"
1950 PRINT "a pattern however, s
o set the"
1960 PRINT "MASKs to 7 (BIN 0000
0111). Now"
1965 PRINT "the range for X and
Y is 0-7 so"
1970 PRINT "the diagonal line wi
ll be repea-"
1980 PRINT "ted every 8th pixel.
 Now, set"
1990 PRINT "the Y MASK to 0 and
you will see"
2000 PRINT "vertical lines inste
ad since"
2010 PRINT "only X affects the r
esult now."
2020 PRINT "Now, call the same D
ATA line"
2025 PRINT "from the other MODUL
E and you"
2040 PRINT "will see horisontal
lines ins-"
2045 PRINT "tead since MODULE2 c
hanges the"
2050 PRINT "X and Y masks (that
is the only"
2060 PRINT "difference compared
to the"
2070 PRINT "MODULE1). You can pl
ay around"
2080 PRINT "with the program now
, but when"
2090 PRINT "you want to create y
our own pro-"
2100 PRINT "grams LOAD the progr
am that"
2110 PRINT "follows this one on
the tape. It"
2120 PRINT "is identical but doe
s not cont-"
2130 PRINT "ain this text. After
 LOADing you"
2140 PRINT "type in your own pro
gram."
2145 PRINT "(You can of cause ME
RGE one of"
2147 PRINT "your old programs, b
ut be care-"
2148 PRINT "ful so that the line
s above 9000"
2149 PRINT "will not be overwrit
ten)."
2150 PRINT "Whenever you want to
 save your"
2160 PRINT "program and the rout
ines simply"
2170 PRINT "GOTO 9980. Use this
to make a"
2180 PRINT "back-up copy. When L
OADing, the"
2190 PRINT "program will auto-st
art at line"
2200 PRINT "9990 and CLEAR and L
OAD the rou-"
2210 PRINT "tines. Much simpler
than it so-"
2220 PRINT "unds. Try it and enj
oy it....."
2230 STOP
6000 DATA "HELLO, HERE ARE THREE
 SMALL"
6010 DATA "UTILITES FROM SANDBER
G SOFTWARE"
6020 DATA "FOR YOUR SINCLAIR SPE
CTRUM."
6030 DATA "THE ONE YOU SEE NOW I
S THE"
6040 DATA "SOFT-SCROLL-ROUTINE W
HICH IS"
6050 DATA "AVALIBLE WITH GOSUB 9
940."
6060 DATA "THE NUMBER OF PIXELS
THAT WILL"
6070 DATA "BE SCROLLED IS CONTAI
NED IN"
6080 DATA "ADRESS 65354. NORMALY
 IT IS 8"
6090 DATA "BUT CAN BE POKED TO A
NY VALUE."
6100 DATA "","","YOU CAN SCROLL
WITHOUT ATTRI-"
6110 DATA "BUTES LIKE THIS.","",
"",""
6120 DATA "","BUT YOU CAN ALSO U
SE THE SCROLL "
6130 DATA "ATTRIBUTES ROUTINE WI
TH                             "
6140 DATA "GOSUB 9960 LIKE THIS
","","","",""
6150 DATA "AND YOU CAN ALSO USE
IT ALONE                       "
6160 DATA "LIKE THIS
                               "
6170 DATA "","","THE LAST ROUTIN
E THIS TIME IS A"
6180 DATA "MULTI-PATTERN FILL RO
UTINE"
6190 DATA "I SHALL TRY TO GIVE Y
OU A FEW"
6200 DATA "EXAMPLES OF THE 18000
 PREPROGRA-"
6210 DATA "MED PATTERNS THAT THI
S PROGRAM"
6220 DATA "CONTAINS. IF YOU LIKE
 YOU CAN"
6230 DATA "THEN EXPERIMENT WITH
THOUSANDS"
6240 DATA "OF PATTERNS THAT YOU
CAN CREATE"
6250 DATA "YOURSELF."
6500 DATA 18,19
6501 DATA 2,33
6502 DATA 39,7
6503 DATA 8,35
6504 DATA 33,41
6505 DATA 38,37
8990 REM *****PATTERN DATA******
9000 DATA 0,0,0,0,0,0
9001 DATA 0,1,1,0,0,1
9002 DATA 0,3,3,0,0,1
9003 DATA 0,7,7,0,0,1
9004 DATA 0,15,15,0,0,1
9005 DATA 1,0,1,0,0,1
9006 DATA 3,0,3,0,0,1
9007 DATA 7,0,7,0,0,1
9008 DATA 15,0,15,0,0,1
9009 DATA 255,255,255,0,2,0
9010 DATA 3,3,3,1,0,3
9011 DATA 7,7,7,1,0,7
9012 DATA 15,15,15,1,0,15
9013 DATA 7,3,15,0,0,5
9014 DATA 7,0,7,0,0,4
9015 DATA 7,7,7,1,0,1
9016 DATA 3,3,7,0,0,4
9017 DATA 3,3,7,0,0,3
9018 DATA 7,7,15,0,0,8
9019 DATA 15,15,31,0,0,16
9020 DATA 31,31,63,0,0,31
9021 DATA 1,1,3,0,0,2
9022 DATA 255,255,255,4,1,0
9023 DATA 255,255,255,4,2,0
9024 DATA 255,255,255,4,3,0
9025 DATA 255,255,255,4,4,0
9026 DATA 255,255,255,4,5,0
9027 DATA 255,255,255,4,6,0
9028 DATA 255,255,255,2,2,0
9029 DATA 255,255,255,2,1,0
9030 DATA 255,255,255,2,4,0
9031 DATA 255,255,255,2,3,0
9032 DATA 2,3,3,1,0,1
9033 DATA 4,7,7,1,0,1
9034 DATA 8,15,15,1,0,1
9035 DATA 31,16,31,1,0,1
9036 DATA 3,6,7,1,0,7
9037 DATA 4,7,7,1,0,1
9038 DATA 15,8,15,1,0,1
9039 DATA 255,7,15,1,0,1
9040 DATA 155,7,15,1,0,1
9041 DATA 155,14,10,1,0,1
9042 DATA 105,34,15,3,0,1
9043 DATA 73,7,12,0,0,1
9044 DATA 163,79,211,1,0,1
9045 DATA 7,73,15,1,2,1
9046 DATA 11,22,33,1,0,1
9047 DATA 13,19,55,1,0,1
9048 DATA 121,173,73,0,0,1
9049 DATA 78,93,37,1,0,1
9050 DATA 27,11,13,0,0,1
9051 DATA 127,127,21,1,0,1
9052 DATA 31,4,12,1,0,1
9053 DATA 11,219,13,1,0,1
9054 DATA 6,79,51,1,0,1
9055 DATA 0,0,0,0,0,0
9890 REM *****PATTERN SUB******
9900 RESTORE 9000+MODUL1: FOR F=
65355 TO 65360: READ BYTE: POKE
F,BYTE: NEXT F
9910 RESTORE 9000+MODUL2: FOR F=
65361 TO 65366: READ BYTE: POKE
F,BYTE: NEXT F
9920 OVER 1: PLOT INVERSE 1;X,Y:
 RANDOMIZE USR 65051: OVER 0: RE
TURN
9930 REM ******SCROLL SUB******
9940 RANDOMIZE USR 65279: RETURN

9950 REM ***SCROLL ATTRIBUTES***
9960 RANDOMIZE USR 64895: RETURN

9970 REM ****SAVE PROGRAM******
9980 SAVE "TEXT" LINE 9990: SAVE
 "CODE"CODE 64895,640: STOP
9990 CLEAR 64894: PRINT AT 10,10
; FLASH 1; INK 2;"LEAVE TAPE RUN
NING": LOAD "CODE"CODE : GO TO 1
```

MC HEADER READER

◆ *Spectrum 48K* ● *Eoin Woods*

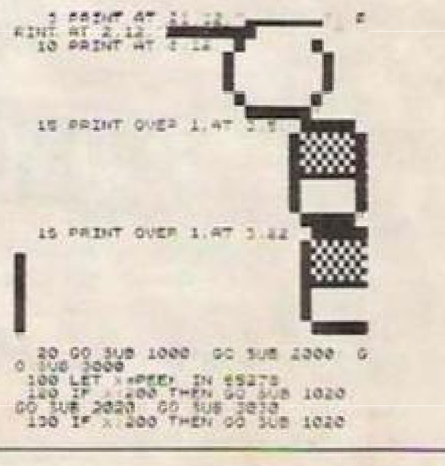
Written for the Spectrum, this program tells the user the type of file which is played into it, supplying information on its file name, length, start address or line and the basic area. Written in Basic, the short program is a useful utility and serves as a good example of short and concise programming.

```
  10 REM ************************
  20 REM *  MC Header Reader     *
  30 REM *  (48K Spectrum)       *
  40 REM *                       *
  50 REM *  Eoin Woods,          *
  60 REM *  37 Coed Glas Rd,     *
  70 REM *  Llanishen,           *
  80 REM *  Cardiff CF4 5EJ      *
  90 REM *                       *
 100 REM ************************
 110 LET count=0
 120 CLS : PRINT AT 11,4;"Please
 Wait-Loading Code";AT 13,10;"Co
unt "
 130 FOR f=60000 TO 60399
 140 READ a
 150 LET count=count+a
 160 PRINT AT 13,16;60399-f
 170 POKE f,a
 180 NEXT f
 190 IF count<>33730 THEN PRINT
 "Error In Data-Check Lines 1000
+": STOP
 200 CLS : PRINT AT 5,0;"Prepare
 Tape To Save Basic"
 210 SAVE "HeadBasic"
 220 PRINT ''"Rewind To Verify"
 230 VERIFY ""
 240 PRINT ''"Prepare Tape To Sa
ve Code"
 250 SAVE "Header"CODE 60000,400
 260 PRINT ''"Rewind To Verify"
 270 VERIFY ""CODE
 280 CLS : PRINT FLASH 1;AT 11,4
;"Press Any Key To Run Code"
 290 IF INKEY$="" THEN GO TO 290
 300 PRINT USR 60000
1000 REM *****Program Bytes*****
1010 DATA 62,2,205,1,22,205,107,
13,33,23
1020 DATA 235,205,11,235,175,55,
221,33,158,235
1030 DATA 17,17,0,205,86,5,221,3
3,198,235
1040 DATA 221,126,0,254,3,32,10,
6,7,33
1050 DATA 51,235,205,11,235,24,3
0,254,2,32
1060 DATA 8,33,64,235,205,11,235
,24,18,254
1070 DATA 1,32,8,33,83,235,205,1
1,235,24
1080 DATA 6,33,100,235,205,11,23
5,33,117,235
1090 DATA 205,11,235,221,229,225
,35,6,10,205
1100 DATA 13,235,33,126,235,205,
11,235,221,78
1110 DATA 11,221,70,12,205,43,45
,205,227,45
1120 DATA 33,137,235,205,11,235,
221,78,13,221
1130 DATA 70,14,205,43,45,205,22
7,45,33,155
1140 DATA 235,205,11,235,221,78,
15,221,70,16
1150 DATA 205,43,45,205,227,45,3
3,170,235,205
1160 DATA 11,235,175,50,8,92,58,
8,92,167
1170 DATA 40,250,254,32,200,205,
107,13,195,96
1180 DATA 234,70,35,197,229,126,
215,225,35,193
1190 DATA 16,247,201,27,22,0,4,7
2,101,97
1200 DATA 100,101,114,32,82,101,
97,100,101,114
1210 DATA 45,83,116,97,114,116,3
2,84,97,112
1220 DATA 101,12,22,2,0,67,111,1
00,101,32
1230 DATA 70,105,108,101,18,22,2
,0,67,104
1240 DATA 97,114,97,99,116,101,1
14,32,65,114
1250 DATA 114,97,121,16,22,2,0,7
8,117,109
1260 DATA 101,114,105,99,32,65,1
14,114,97,121
1270 DATA 16,22,2,0,66,97,115,10
5,99,32
1280 DATA 80,114,111,103,114,97,
109,8,22,4
1290 DATA 0,78,97,109,101,58,10,
22,6,0
1300 DATA 76,101,110,103,116,104
,58,9,22,8
1310 DATA 0,83,116,97,114,116,58
,0,0,0
1320 DATA 0,0,0,0,0,14,22,10,0,6
6
1330 DATA 97,115,105,99,32,65,11
4,101,97,58
1340 DATA 27,22,12,0,80,114,101,
115,115,32
1350 DATA 65,110,121,32,75,101,1
21,45,83,112
1360 DATA 97,99,101,32,69,110,10
0,115,0,0
1370 DATA 0,0,0,0,0,0,0,0,0,0
1380 DATA 0,0,0,0,0,0,0,0,0,0
1390 DATA 0,0,0,0,0,0,0,0,0,0
1400 DATA 0,0,0,0,0,0,0,0,0,0
2000 RESTORE 1310: FOR f=1 TO 20
2010 READ a: PRINT CHR$ a
2020 NEXT f
```

SPECANORY

◆ *Spectrum 48K* ● *K. Derrick*

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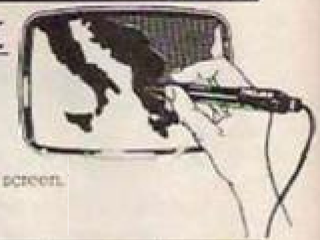
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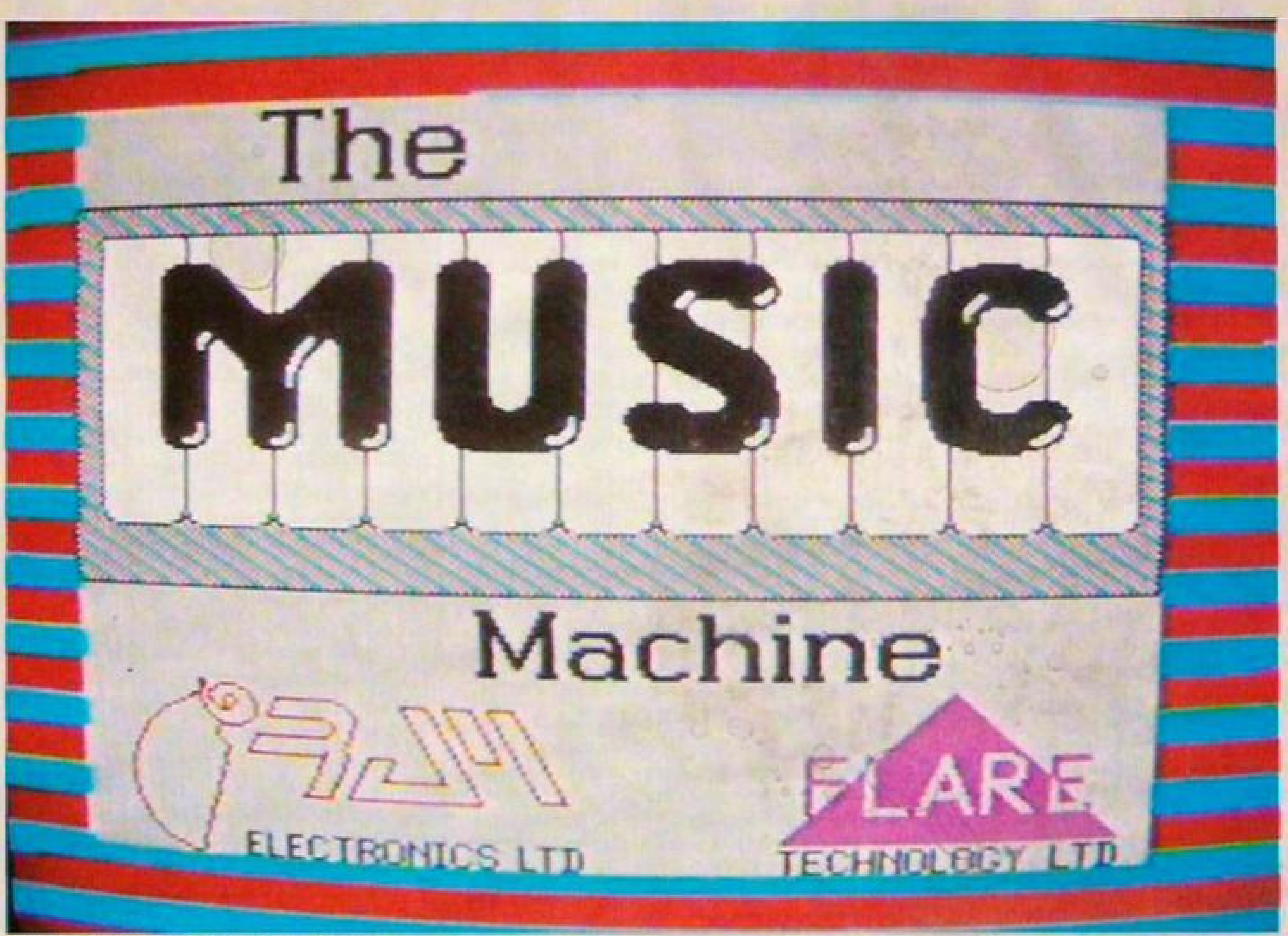
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YC/2/87

The Music Machine muscles in

Owners of Spectrum and Amstrad CPC computers have not been particularly well-served for musical software and hardware. Now, to their rescue, Ram Electronics has an all-singing, all-dancing package called The Music Machine. *Tony Sacks examines.*



The loading screen for Music Machine.

It is a sound sampler, a drum machine, a composer and a Midi interface, all built into one neat package. Previously any one of those items may have cost £50 or more; now all are in the *Music Machine* for £49.95.

The hardware takes the form of a sturdy little box which plugs into the computer expansion port. On its top is a sliding control – no maximum or minimum positions indicated – and at the rear you will find six sockets of various formats, all anonymous. The lack of marking is a particular nuisance with the three identical-looking DIN sockets which prove to be In, Out and Thru Midi connectors for linking the Music Machine to synthesisers and other electronic instruments.

A clever lug prevents you plugging-in the interface when the Spectrum power lead is in place. In theory, once the interface and power supply are connected you load the software and away you go. When we first plugged-in the Music Machine, the Spectrum keyboard went dead. It transpires that our Spectrum was one of a small number which seem to have sub-specification microprocessors. Normally that does not matter but the Music Machine reaches parts of the processor other packages do not, hence the deceased keyboard. If you find you have this problem, Ram Electronics will replace your faulty processor.

Something odd

With a new processor in place, the software loaded perfectly to reveal a main menu offering some 14 options. They are selected by pressing a captialised letter – not necessarily the first letter – for each choice. Pressing "P" for Play or "M" for Midi seems natural but there is something odd about pressing "O" for piano or "H" for ecHo. A word of warning – avoid the "I" button or you will find yourself irretrievably in basIc!

Most menu choices take you to other screens, which appear and disappear agreeably by wiping sideways on and off the display. The one exception is "Play", which initiates

whatever tune is stored in memory without abandoning the main menu.

Also on the main screen is a list of up to eight "samples" stored in the micro memory. If you have not encountered sampling previously, it is a technique for storing real sounds digitally in memory. The sounds can later be played back like a tape recorder.

When the Music Machine software is first loaded, the memory is filled with seven percussive samples and one bland instrumental noise called "synth". The total time available in memory for all the samples is slightly more than one second, so each of the eight samples lasts about 0.15sec. That is sufficient for short percussive sounds but cannot cope adequately with sounds like piano notes, which take several seconds to die away.

The limited life of the samples can be heard most clearly when you select the Drums screen. It allocates each of a cluster of QWERTY keys to a different sample. Tap the key and the sample sounds. For some sounds, such as the pair of tom-toms, the short time-span is no problem but others, such as the cowbell, have a definite clipped feel to them.

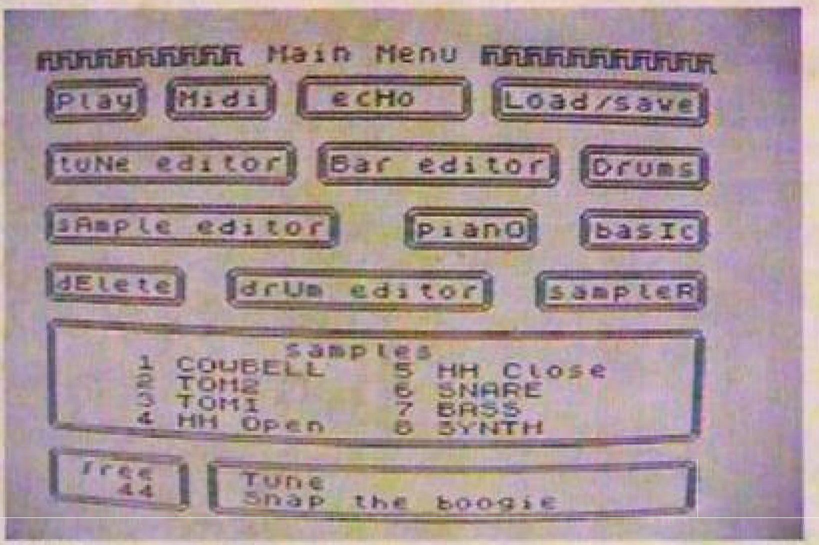
Tune editor

That limitation becomes less important when the samples are combined into rhythmic patterns in the Drum Rhythm Editor section of the program. There up to three samples can be made to sound simultaneously by placing marks corresponding to each sample on horizontal lines representing a bar of music. The bars can be given names and numbers and, by moving to another screen called the Tune editor, can be strung together to form songs.

On the Tune editor screen one encounters one of the slightly confusing aspects of the Music Machine. In addition to stringing together the drum patterns created using the Drum Rhythm Editor, you can also string together bars of music created on yet another screen called the Bar Editor. To add to the confusion, you must choose on yet another screen, called Midi, whether you want to listen to drums or music; you cannot do both simultaneously.

The essential difference between Drums and Music is that while both use the same sampled sounds from the micro memory, the Drums mode plays them back at the speed they were recorded, whereas the Music mode plays them back at varying speeds to alter their pitch. Thus, in the Music mode you can thus play a tune with any of the samples, even percussive sounds, although the results are not always particularly musical.

The advantage of the Drums mode is that three samples can be played simultaneously.



Main menu – the choice is yours.

In the Music mode only one samples can be heard most although that sample can play simultaneously at two different pitches in some circumstances. So you see what I mean by confusing?

The Bar editor is the Music mode equivalent of the Drum Rhythm editor in the Drums mode. This screen uses a slightly unconventional musical notation to place notes on a conventional treble and bass stave. Instead of the usual blobs, bar-shaped notes are placed on the stave lines – or spaces – like beads on a string. Only one note length is available and you are limited to a choice of eight, 12 or 16 beats in a bar.

As with the Rhythm editor, you compose one bar at a time and move to the Tune editor screen to string together the bars into a tune. Two notes, the same sample at two different pitches, can play simultaneously. That is double the number of notes which can be played on most other micro-based sampling systems.

Imaginary piano

A screen called Piano turns 13 of the QWERTY keys into an octave of a piano keyboard. Only one note can sound at a time when playing this imaginary piano. The only way to play two notes simultaneously in real-time is to have an external Midi keyboard plugged into the Midi In socket of the Music Machine.

As well as playing with the samples provided with the Music Machine, you can make your own. The Sampler screen is the most colourful of a rather drab collection. It has a green/yellow/red sound level meter like those found in hi-fi equipment. As you make noises into the microphone provided with the Machine, the colourful bar moves back and forth. That permits you to set up a level for recording your sample.

Before you proceed, however, you have to make space for the sample in the micro memory be deleting one or more of the existing samples – after you have saved them for later use. The more old samples you dispose of, the longer your new sample can be. To record, you press T for trigger and make your noise.

You then proceed to a Sample Editor screen where you can tidy your sample. Quiet or unwanted sections can be removed from the start or end of the sample and the memory that frees is then available for further samples. The Editor gives an oscilloscope-like display of the sampled sound and you can zoom into tiny segments for precise editing or mere curiosity. It is interesting, for example, to see how short a musical sample can be before it loses its identity and becomes a noise.

The final screen, other than one dedicated to loading and saving, produces echo effects. More precisely it delays the sound received from the microphone by a variable amount. The original, undelayed sound is not fed to the output, so you do not get a true echo effect, but it is fun nonetheless.

Fun the key

Fun is, indeed, the key to the Music Machine. There are several omissions about which one could quibble if it was just a sampler, a drum machine, or a Midi interface. If you are particularly interested in one of these functions, it might be better to buy a dedicated package but if you are happy messing about with sounds without worrying too much about their quality, you cannot go wrong with the Music Machine, especially at its price.

Ram Electronics is talking about offering additional software packages for the interface which might delve deeper into the Midi potential but exploring the possibilities of the existing software package will keep you busy for some time.

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YC/2/87

Robots – a short history

The image of the robot as portrayed in films such as Star Wars is some way from today's reality. Peter Luke reports.



Petster Deluxe from Axlon.

In retrospect, 1984 was not the year Big Brother had any impact on the way in which we lead our lives, nor was it the year of the robot as predicted by some technology observers at that time. Those observers had seen the phenomenal growth in the personal computer industry in the previous few years and were predicting that where the computer industry had gone before, the robot industry was sure to follow. That, however, was at a time before the PC bubble had burst and also paid little attention to the demands the end-user would make on a product marketed as a personal robot.

At the time the products taking centre stage in the robot market were machines such as Androbot, Hubot and RB5X – all impressive-sounding names linked to products which in the main were little more than fairly basic computer systems put on to a mobile platform.

Compare devices with that kind of specification to the type of product which might satisfy the requirements of the consumer whose aspirations were based on the capabilities of the R2D2 and C3PO robots of *Star Wars*.

It would be reasonable to anticipate that the purchaser of a home robot would expect the machine to have a continuous speech recognition facility so that the robot owner could tell the machine literally what was required of it. In addition, the system would have to incorporate a task planner to permit it to devise a method of accomplishing any instructions it had received.

Object database

Such a task planner would be able to translate a command such as "answer the front door", into a sequence of machine level commands to move the robot from its current position to the front door and, by means of a manipulator, to open the door. For the robot to move in the home environment it would require both a world state database and an object database. They would record the fixed geometry of the environment, the position of walls and doors and the location of movable objects such as furniture.

As part of the navigation process, the robot would also have to be equipped with a visual recognition system. Only by incorporating all those features would a robot system be able to accept programming instruction from a non-expert user and be expected to carry them out with any degree of success.

Even the briefest analysis of the level of systems performance required to accomplish the specification outlined would show that, at the current level of technological development, it will be some years before the capability to realise those goals will be available. Taking only the first requirement, that of continuous speech recognition, even IBM, with an annual R&D budget rivalling the GDP of some smaller countries, predicts that it could be 20 years before such a system could be realised.

Certainly in 1984 the existing techniques could not hope to realise a workable personal robot, even if price were no object – and price would certainly be an important factor in deciding whether a robot were to succeed as a consumer product. Given those factors, it is easy in retrospect to understand why those first robot pioneers misjudged the demands of the domestic market.

Not all those early companies targetted the home market; others saw the education market as their main outlet. Those companies predicted that there would be a demand for turtle-type

robots to demonstrate the principles of computer control systems and those of basic geometry. Such turtle robots, in conjunction with low-cost micro computer systems and the Logo computer language, were marketed



aggressively in the educational community.

While such systems, in contrast to those aimed at the home, were able to fulfil the role in which they were cast, the turtle marketing men had failed to take one vital element into consideration when formulating their business plans. That fact was that education establishments had no money to spend on elementary textbooks, let alone expensive computer hardware. That situation was aggravated by the fact that, while schools could obtain Government aid when purchasing computers and software, robots were excluded from such schemes.

Doom and gloom

After struggling for a few years, the majority of small British companies aiming to make their way in the education market had ceased operating by the end of 1986.

The foregoing history of the robot market is one of doom and gloom. There



is, however, some hope for the future of the robot industry. That future lies in a more realistic assessment of the needs of the market and a segmentation of the industry into a number of well-defined segments.

The first is the toy end of the market. Devices such as the Petster make no pretensions towards being a personal robot yet they are robotic devices. Their ability to react to their environment in a basic fashion qualifies them for inclusion at the lower end of robot capabilities.

Next up the ladder of sophistication are small industrial robots. They perform a range of basic manipulative functions and development of those systems means that increasingly more sophisticated manipulators and pattern recognition systems are being developed to meet the needs of industry. At the top end of the robot market are large-scale robot systems, as used by the likes of car manufacturers to handle large items of material.

Recreational machines

Perusing the analogy of the computer industry, the toy robot can be likened to the home computer, the most successful of which are marketed as recreational machines alongside more traditional toys. Next up the computer ladder are PCs. They are used in business to increase productivity and correspond to the small industrial robot systems. The upper end of the computer industry is the mini and mainframe computer. Those systems compare to the large-scale industrial robot.

From that analogy it can be seen that the best definition of a personal robot, given the level of technology available today, corresponds to a small industrial robot of limited capability.

In retrospect, it is clear that the aspirations of those who sought to develop a market for personal robots were over-optimistic about the capabilities of the technology available to them. Many companies active in the early days of the personal robot market paid the price of over-optimism and are no longer trading today. The future of the robot market, however, is secure, though it will be some time before Dixons will be selling an Amstrad version of R2D2.



RTX, the world's first 'personal working robot' by Universal Machine Intelligence.

The complete Commodore

Michael Graham reports on some of the add-ons available for the CBM64.

The Commodore 64, in common with the Spectrum in its current incarnation, is one of the oldest home computers still available. It is a tribute to the designers of the machine that while some aspects of its performance leave something to be desired by the standards of today, the specification of the CBM64 can be compared favourably to other more recent designs. While overall the 64 was and still is good performer, in one area it has a very poor specification, namely in the way that the computer handles disc-based mass storage.

For some reason best-known to itself, when designing the disc port and drive a serial rather than parallel format was chosen for the transfer of data. That decision means effectively that, other things being equal, the data transfer rate of the CBM64 will be more than eight times slower than systems based on a parallel exchange of data. It is for that reason that the Commodore 64 takes so long to load substantial programs from disc.

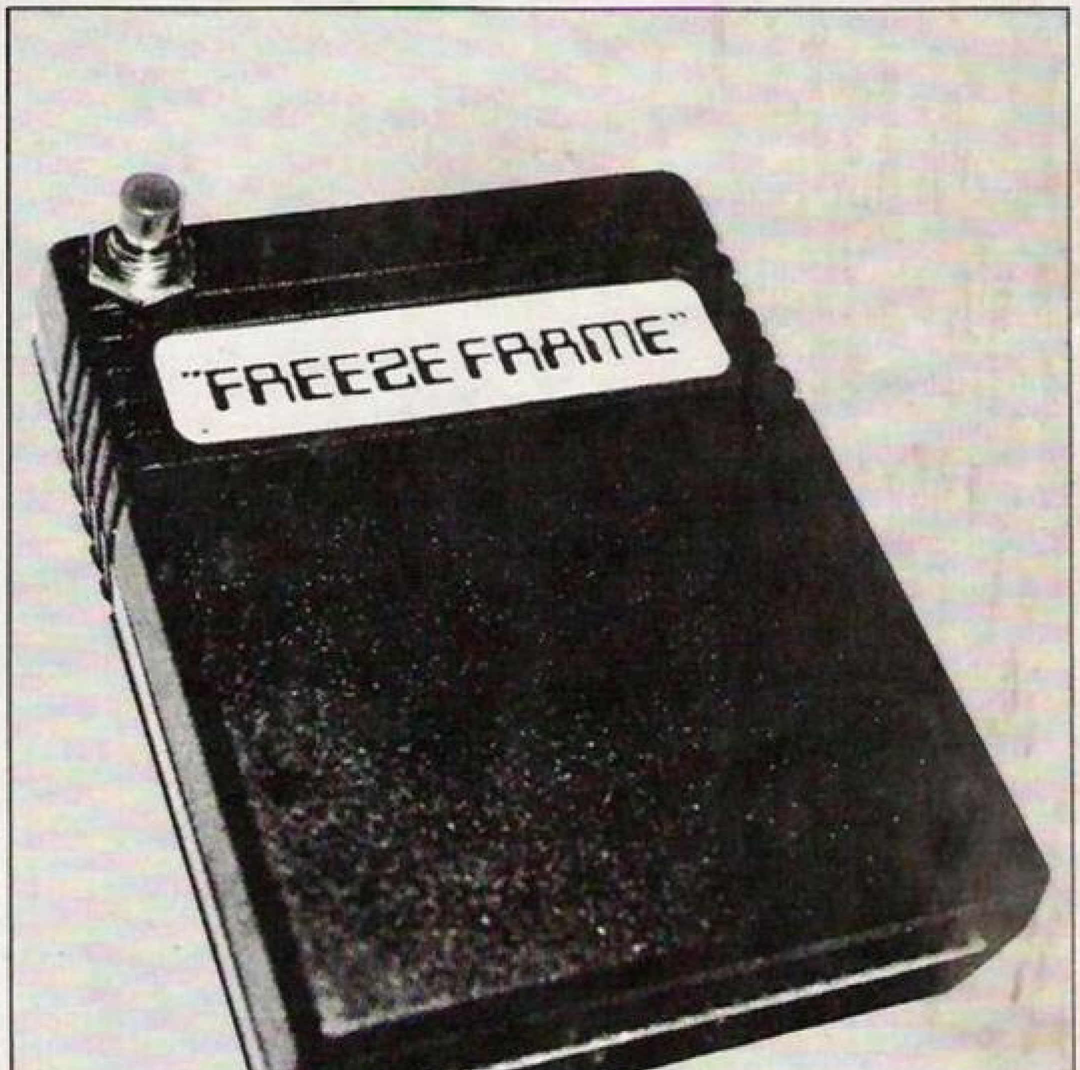
Increased reliability

For many users the advantage of using a disc drive with their machines lies not so much in the speed advantage, though even the CBM disc drive is faster than a cassette recorder – although at times it may not seem like it – but with the increased reliability of a disc-based system.

For the CBM disc owners who wish to improve the performance of their systems, the *Dolphin DOS* system distributed by Evesham Micros provides the CBM64 with a fast, efficient parallel DOS system. In addition to speeding load and save operations. Dolphin DOS provides a number of useful commands which overcome some of the idiosyncrasies of the CBM DOS.

Dolphin DOS is not simply a software package; to use the system it is necessary to make some modifications to the hardware of both the computer and the 1541 disc drive. The modifications are straightforward, though in some cases it will be necessary to de-solder some circuitry. That is not a job for the faint-hearted, though the task should not be beyond the capability of most people.

When modified, the user will have a choice of running the system in native 64 DOS or, at the flick of a switch, using the Dolphin DOS. When using Dolphin DOS much of the complex syntax associated with the CBM DOS may be dispensed with, although Dolphin DOS will recognise all CBM format commands. Good examples of the simplication of commands are the load and save commands.



The Freeze Frame tape/disc transfer cartridge.

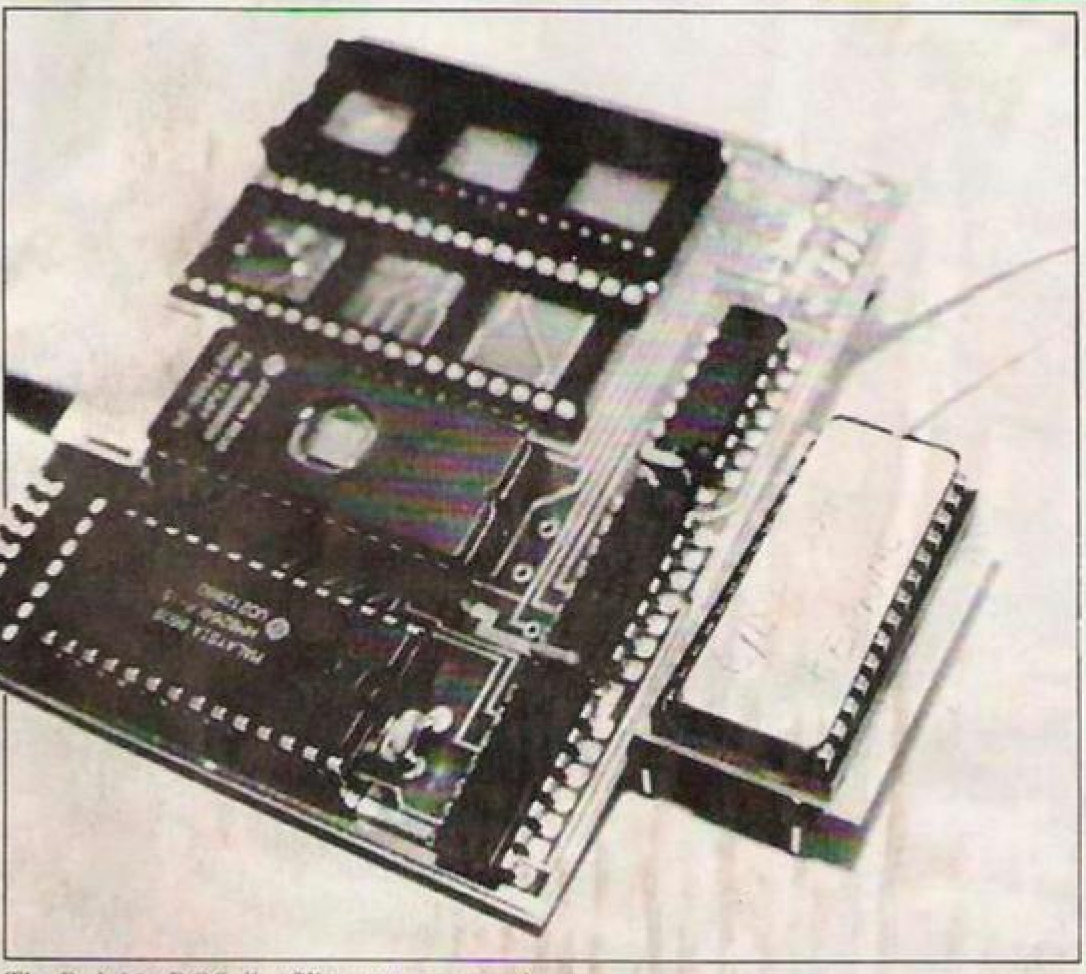
Simplified command

CBM disc users will be familiar with the convoluted LOAD "NAME",8,1 structure. Dolphin DOS allows that command to be replaced with the more conventional LOAD "NAME", the device number and secondary address numbers no longer being necessary. The SAVE command is also simplified in a similar way.

One minor point to note is that Dolphin DOS does not support cassette load and save operations. To use the cassette recorder it is necessary to switch the system to its Commodore mode of operation.

Tape transfer utilities have always been popular with home computer users, although the software industry has not taken kindly to devices which lay commercial software open to the activities of the software pirate. It is for that reason that the front cover of the brief instruction manual which accompanies Freeze Frame bears the message "strictly for personal use".

The Freeze Frame unit is a small plastic box which plugs into the cartridge port of the Commodore 64. With the cartridge in place, the usual sign-on message is replaced with one which announces the presence of Freeze Frame, together with a number of main menu options. They permit the main Freeze Frame options to be selected.



The Dolphin DOS disc filing system upgrade.

The options can be split into three parts – the saving of programs resident in the memory of the computer, the saving of the extra parts of some cassette-based software, and the use of miscellaneous utilities supplied with the unit.

Copy protection system

The main function of the unit is to copy memory-resident programs to either disc or tape for back-up purposes. One of two modes may be used to save programs. One will deal with the majority of programs, while the other will deal with programs which check for configured memory during loading as part of their copy-protection system.

In use, the program to be copied is loaded into memory and, at a convenient point in the program, usually a menu screen, the button on the Freeze Frame cartridge is pressed to start the copying process. At that stage the user is presented with four options, including both save to tape and save to disc functions.

Freeze Frame was compatible with those programs on which we had an opportunity to test the system. The ability to copy programs and the utility programs associated with the formatting of discs and the copying of files will be welcomed by many serious Commodore owners.

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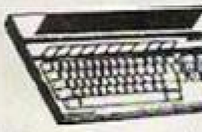
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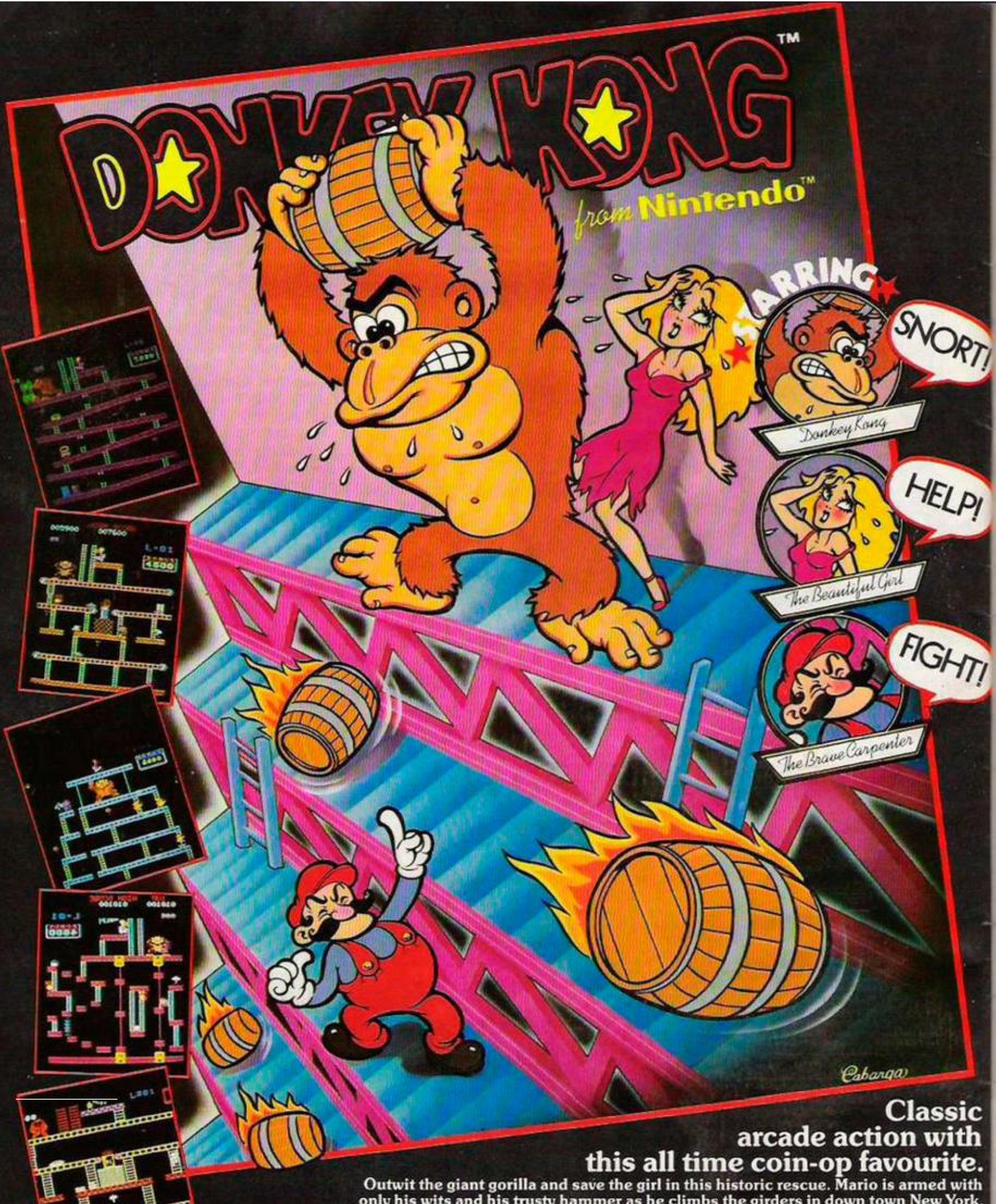
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ADVERTISERS INDEX

A
AMSTRAD 6, 7
ABC 70

C
COMPUTER NOVELS .. 3, 11
CHEETAH 34

D
DIRECT DISK 18

E
EVESHAM 70
ECL 51

I
INTERFACE 67, 71

M
MICRONET 29
MAROS 75
MICROPROSE 2

O
OPUS 41
OCEAN 76

S
SCHOOL SOFTWARE 66
SWANLEY 75
SILICA SHOP 83
SUPERTEC 14

T
TROJAN 66
THOUGHTS & CROSSES . 10

U
U.S. GOLD 84

V
VOLEX 25

W
W.A.V.E. 82

Z
ZX MICROFAIR 66



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